THE MODEL ENGINEER

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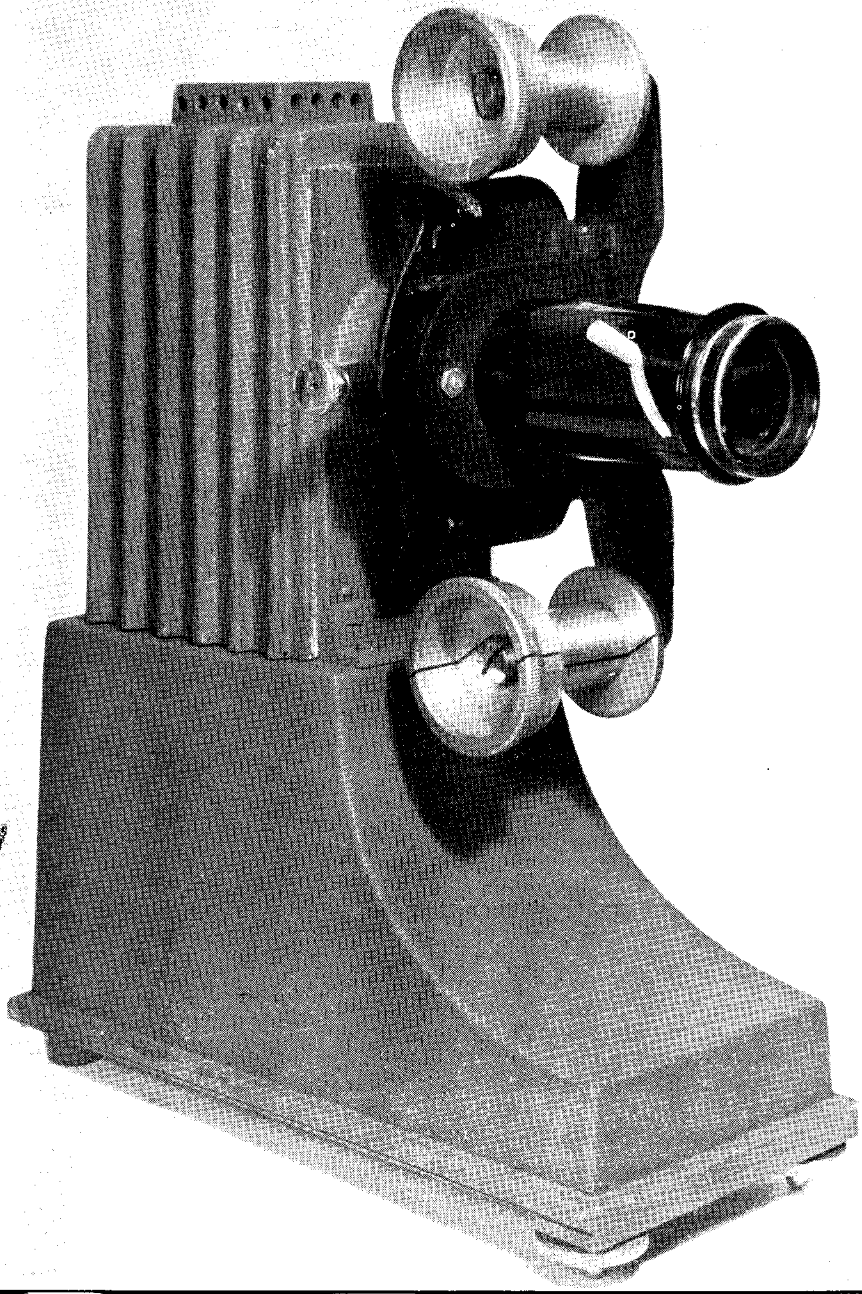

The MODEL ENGINEER

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2ND MARCH 1950 VOL. 102 NO. 2545

SMOKE RINGS

A New Steam Engine History

● WE HAVE been reading a new book entitled "Steam-Engine Builders of Suffolk, Essex and Cambridgeshire," by Ronald H. Clark, published in Norwich, by The Augustine Steward Press. Price 6s. 6d. net.

It may come as a surprise to many enthusiasts to know that, at one time, there were as many as thirty-five separate companies building steam engines in the three East Anglian counties named in the title of this extremely interesting book; and the types of engines concerned ranged from railway locomotives to steam winches, by way of traction engines, ploughing engines, vertical engines, horizontal engines, portable engines, cranes and capstans. In fact, there is probably no form of steam engine which is not given at least a mention in this book.

What memories are stirred by such names as: Cocksedge & Co., of Ipswich; Richard Garrett & Sons, of Leiston; Ransome, Sims & Jefferies, of Ipswich; Davey, Paxman & Co., of Colchester; Eddington & Stevenson, of Chelmsford; or Headley & Edwards, of Cambridge. These are only a few from the complete list of engineering works involved. Of the total, only four are making steam engines today, and these only to special order; most of the remainder have either gone out of business or given up steam.

Mr. Clark's text is essentially historical in character; he has divided it into three main sections, one for each county, and gives brief surveys of the history of each company and its products. There are 100 illustrations in line and half-tone, many of which are rare if not unique.

It is clear that a great deal of research has gone into the collation of the contents of this book, and we have not the least doubt that very many readers will enjoy the result as much as we have. Moreover, it is a book of a kind that should be much more frequently written to supplement the purely technical records of mechanical development.

A Society for Banbury

● WE HAVE received news of the recent formation of the Banbury Model Railway and Engineering Society. Although the model railway interest appears from the title to be foremost, the society evidently intends to cater for other branches of our hobby. The hon. secretary is Mr. A. Trainor, 44, Cherry Road, Banbury, Oxon, who will be pleased to supply any information about the society to interested readers. Negotiations are in hand for some clubrooms, and it is hoped to install a model railway layout very soon.

To Club Secretaries and Others

● WE HAVE lately been receiving announcements from a few hon. secretaries and press relations officers to whom we would, once more, address a friendly appeal. Will these gentlemen please take *special* care to see that the name and full address of the hon. secretary is included in each announcement sent in for publication? In some cases, recently, this information has been omitted, and although we know that we have a card index giving the required information, we are unable to guarantee that it is either accurate or up-to-date, and sometimes an error appears in print. This causes annoyance to the clubs concerned as well as to ourselves, and could easily be avoided if every club secretary, or his appointed deputy, ensures that the written announcements are *complete* before they are posted to us. Each week, we publish club announcements, every one of which has been duly edited and, often, rearranged so that it may be regarded as typical of the kind that we require. Our services in this matter are entirely free of any charge, so we think we are not unreasonable in making a request for a little care on the part of those we are pleased to serve.

One other point is that, from now onwards, we can accept club notices up to fourteen days ahead of publication, instead of three weeks as hitherto. We hope that all clubs will welcome this improvement.

Locomotive Mileages

● SEVERAL READERS have written to enquire as to the accuracy of our statement that, before the war, the G.W.R. "Castles" were "averaging something like 160,000 miles between heavy repairs," and more than one of our interrogators suggest that this figure is exaggerated. The chief source of our information is the C.M.E. Department's report for the year 1939, published in *The Great Western Railway Magazine.* However, we have been familiar with the work of the "Castles" and other well-known locomotive classes for many years, and the figure we quoted is not unique, though it is, perhaps, unusual. In the pre-war years, the distances which our main-line locomotives ran, between "shoppings," varied a great deal. The G.W.R. seemed quite content to leave the decision to its Locomotive Running Superintendents who, from most points of view, were best qualified to judge when an engine was needing a heavy overhaul. The result was that many G.W.R. locomotives ran great distances between "heavies." On the other hand, the L.N.E.R. seems to have imposed a definite limit of 100,000 miles for their best main-line passenger engines at least, and a Running Superintendent who permitted engines under his care to exceed this figure was usually subjected to a searching enquiry.

On at least one section of the old L.M.S.R., mileages in excess of 160,000 were sometimes achieved by certain of the locomotives engaged on long, through workings lasting over many months. But what did it matter, so long as the engines showed no signs of needing heavy repair? It all boils down to a matter of faith in the engines and confidence in their design and construction, not to mention the excellent condition in which they were usually maintained.

We would, however, just add that the figures we have quoted belong to the pre-war, peacetime era; during the war, when almost every locomotive in Britain was pressed into the most strenuous service and kept going till she almost fell to pieces, some of the mileages achieved make the figure of 160,000 look a trifle pale.

How long it takes a locomotive to work up a total of 160,000 miles depends on a variety of circumstances; but to give an actual instance from our own observation, a "Castle" working Newport to Paddington and back, non-stop each way daily, six days a week, covers 267 miles plus light-engine running to and from the sheds, each day. Roughly, this is 1,600 miles per week; therefore, the time required to run the specified total is about 100 weeks or, say 23 months. And we know of more than one engine that has done it.

Spenborough Society Successfully Formed

● FOLLOWING UPON our recent announcement of the proposal to form a Spenborough Society of Model Engineers, we have received news that this was successfully accomplished at the meeting called for January 23rd. Mr. Tom Senior, who was the prime mover in the scheme, was elected founder-president; he is supported by a committee of nine, with Mr. S. Barraclough as hon secretary and Mr. D. Hall as treasurer.

The society is hoping to organise an exhibition in the near future; but in the meantime we are pleased to note that the attendance at the inaugural meeting was excellent and included our old friend, Mr. W. D. Hollings, of Birkenshaw, who had two of his locomotives on show.

This seems to suggest that local interest is keen and that the future of the new society is assured. Mr. Barraclough will be pleased to hear from anyone who may wish to join; his address is: 8, Crossly Yard, Northgate, Cleckheaton.

Plough-engines at Old Dalby

● SOME WEEKS ago, we published a letter from Mr. R. Taylor, of Leicester, who referred to a pair of Fowler ploughing engines and a smaller one owned by a farmer, Mr. C. Grice, of Old Dalby, Leics. Mr. Taylor stated that the numbers of the ploughing engines were 14148-9, and omitted to give any number for the smaller engine.

Mr. H. Barker, of Chiswick, London, has written to say that the numbers of the ploughing engines are 15148-9 of Class BB1 built in 1918. The smaller, single-cylinder engine is No. 5901, and was built in 1888; she is, therefore, 61 years old and is still in working order, except for a weak smokebox. Mr. Barker suggests that this engine, particularly, is a credit to her makers; he also states that in 1888 there would be very few injectors in use, which would account for the fact that No. 5901 has not got one.

We are inclined to agree with this statement, because the injector, in those early days, did not achieve immediate universal popularity; the average farm-engineman had yet to become acquainted with the proper way of handling the device.

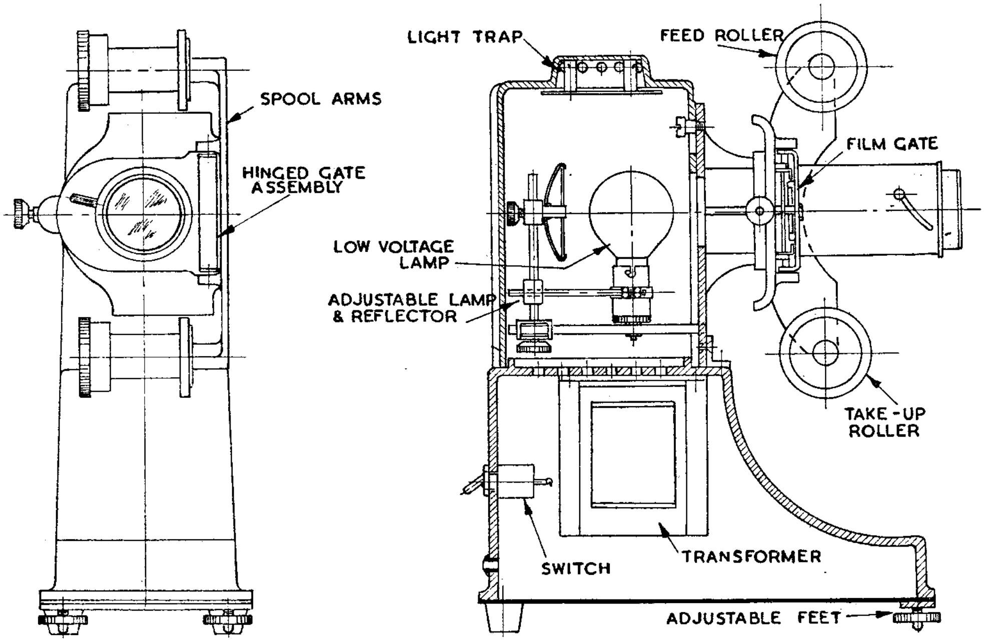
Miniature Slide and Strip Projectors

by " Kinemette "

IN a series of articles on " Simple Optical Projectors," published in THE MODEL ENGINEER nearly fourteen years ago, the writer remarked that although the old-time " magic lantern " had long been obsolete as a means of public entertainment, it still had a wide sphere of usefulness as an aid to education and instruction. Despite the fact that its modern successor, the cinematograph, has even more boundless scope in the latter sphere, it has not yet come anywhere near ousting the " still " projector; on the contrary, the use of the latter, in its various modern forms, has increased very considerably, though even so, its possibilities are by no means exhausted yet, and new uses or applications for it are constantly being found.

All forms of optical projectors nowadays which are employed for educational purposes are classified under the heading of " visual aids," and comprise various types of " diascopic " projectors (for the projection of slides and transparencies from the standard 3¼ in. × 3¼ in. size downwards), " episcopic " projectors (for projecting printed pictures or solid objects), " epidiascopes " (which combine the properties of both the foregoing types), and cinematographs, which invariably employ the diascopic principle of projection, combined with mechanism for producing the illusion of movement by projecting a series of pictures in rapid succession. These elementary definitions are given simply for the purpose of avoiding any possible confusion of terms in subsequent references to the various types of projectors.

All these devices have their own particular merits and limitations, which affect their adaptability in specific cases. The diascopic " still " projector is not only the simplest type, but also the most efficient in the utilisation of a given illuminating power. In the latter respect, the episcopic projector, in any of its forms, falls very much short of ideal; a very powerful illuminant is necessary to provide reasonable brightness of the projected image, even with a wide-aperture objective lens. Against this, however, is the advantage of avoiding the necessity for providing specially-made slides or transparencies for projection. The still greater range of utility of the epidiascope is offset by the fact that in trying to compromise between two incompatible principles of projection, it sometimes fails to attain efficiency in either, and it is usually bulky and expensive. In the cinematograph, the superlative advantage of animation, and continuity of projection, is obtained at the cost of some loss of illuminating efficiency, an ela-



General arrangement of single-frame filmstrip projector

borate and expensive apparatus, and also a fairly considerable expense of the subject matter, i.e., the film.

For Comparative Reasons

As the present series of articles is concerned only with specialised forms of diascopic projectors, the other types are discussed purely for comparative reasons, and may be set aside for the present, though some further reference will be made to them later. While the older form of slide lantern is still extensively used, and has changed comparatively little in design, except in so far as desirable to adapt it to the use of electric filament lamps, which have now superseded all other forms of illumination, there has been a tendency within recent years to use smaller slides or transparencies. This conforms to tendencies in photography, where miniature cameras have become extremely popular, and one of the first developments in introducing smaller slides was the 2 in. × 2 in miniature slide, suitable for printing by contact from negatives taken by 35-mm. cameras, the actual picture size of which is equal to two standard cine "frames,' approximately 1½ in. × 1 in. This size is also useful for projecting colour transparencies, which on account of increased expense of the sensitive material, are usually quite small, and being produced by a reversal process, only the original "negative" material is available, and cannot readily be duplicated, especially if any alteration of size is required.

In producing slides from colour films, the usual practice is to sandwich the cut film between two plain glasses, with the usual mask and binding, though metal frames are sometimes used. The slides can be used in exactly the same way as those of the larger standard size, with appropriate size carriers, though new and ingenious, though sometimes needlessly elaborate, methods of passing them into and out of the focal plane of the projector have been introduced in some cases.

Easily Transported

But where the transparencies are made from flexible films, it may well be questioned why it is necessary to enclose them in glass at all, thereby introducing all the disadvantages of glass plates—bulk, weight, fragility, etc. One very sound reason, of course, is to prevent the film surface becoming damaged by abrasion, and in the case of valuable colour pictures which cannot be duplicated, this will probably outweigh all other considerations. In pictures which can be readily printed from the original negatives, however, there is much to be said for arranging them on a continuous strip of film, which can be rolled into a compact space when not in use, and is very easily stowed or transported. The strip is passed through the stage of a projector similar to a cinematograph, but without its shutter and rapid-shift mechanism, the only essential requirement in this respect being some means of pulling the strip through the stage or "gate," one frame at a time. The standard 35-mm. film, being provided with perforations, facilitates the fitting of some simple form of sprocket gear which enables each frame to be positively located, but this is by no means a necessity, and the primitive method of winding up the take-up roller, as in a simple roll film camera, is sufficient to fulfil essential requirements.

Double-frame or Single-frame

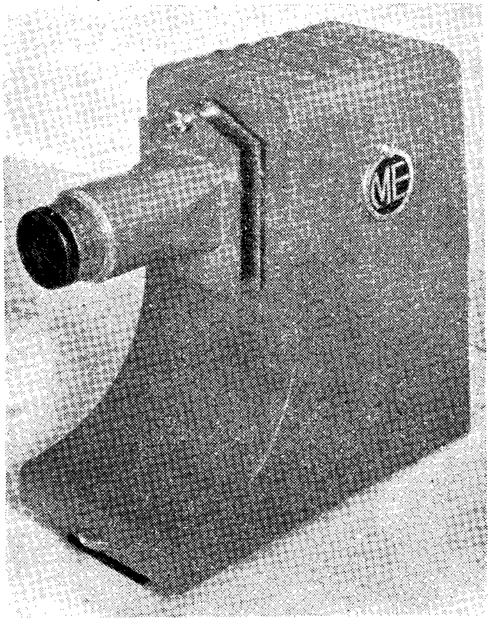
The frame size may be either the same as that of the popular miniature cameras, commonly termed double-frame, or of the 35-mm. cinematograph, termed single-frame. While the former has the advantage of requiring less magnification than the latter, and can also be contact-printed from 35-mm. camera negatives, the latter enables twice as many pictures to be accommodated on a given length of strip, with consequent economy in cost, and greater convenience in stowage. The definition obtainable with the single-frame picture, while slightly inferior to that of the double-frame when very large screen pictures are required, is generally good enough for most practical purposes; provided, of course, that the original negatives are sharp, and the printing is properly carried out. Most of the film strips available from educational establishments and film libraries are of the single-frame type, and it may be observed that a large and rapidly-growing selection now exists on a very wide range of subjects. Although the field of mechanical engineering has not yet been very fully explored in this medium, except possibly by some service training establishments, there is some reason to believe that this will receive attention in due course.

Reduction of the transparency frame size naturally enables the size of the complete projection equipment to be correspondingly reduced, and projectors for single-frame film strips can be made extremely compact, without any serious loss of projection efficiency. While their optical principles are identical with those of the older forms of "magic lanterns," advantage may be taken of the most up-to-date optical design to obtain the maximum projection efficiency from illuminants of moderate power.

Construction of Projectors

Some readers whose entire activities and attention are centred on the construction of models may be inclined to ask "What has all this got to do with model engineering?" Well, as a matter of fact, it has a very direct bearing on our pet subject from two totally different points of view, namely, as an appropriate exercise for construction in the home workshop (even if it is not a "model" in the usually-accepted sense) and also as a piece of utility equipment in the service of model engineering. In the former respect, it is believed that a "still" film strip projector is worthy of taking its place with THE MODEL ENGINEER home cine-projector, which was described in 1937 and has been built by hundreds of THE MODEL ENGINEER readers; moreover, its popularity as yet shows little signs of diminishing. For the latter, the educational side of model engineering is by no means its least important aspect; quite apart from the value of a projector for illustrating

club lectures, it may be employed to promote publicity at model exhibitions, and to demonstrate that models have a definite educational value. Owing to the cheapness and ease of reproduction in producing film strips, clubs could build up a useful film strip library, and as the films are very easily sent through the post,

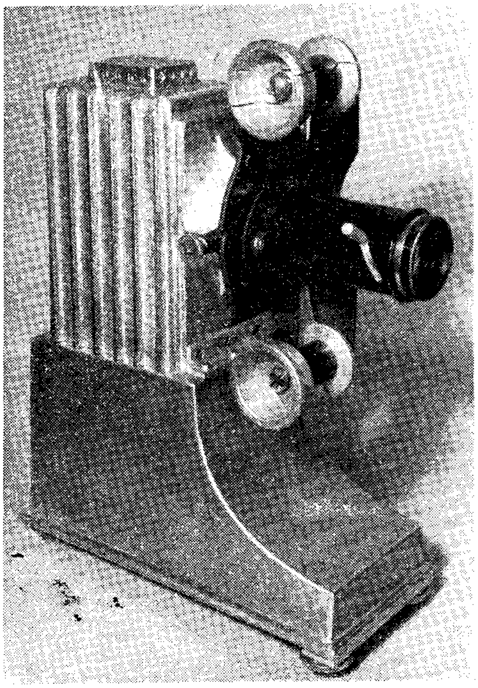


Miniature projector to take slides, or filmstrips (either single- or double-frame). Interchangeable stage fittings not shown

interchange of lecture material between clubs would be facilitated. The material for a well-illustrated technical lecture could quite easily be carried in the waistcoat pocket.

During the past two or three years, the writer has carried out a good deal of experimental work on simple projectors suitable for amateur construction, and the results of these endeavours are offered here to readers in the hope that they will be of practical interest. The first complete design produced was that of a projector adaptable for the projection of miniature slides, and also film strips of either the double- or single-frame type. To cope with these requirements, it was necessary to furnish it with a stage capable of taking either a slide carrier or a strip holder, and the latter also had to be fitted with a removable mask and adaptable for dealing with either horizontal or vertical frames. The reason for this was that the negatives taken by miniature cameras may be either horizontal or vertical, and in any case the long and short dimensions would be in opposite phase to those of the single frames. It may be mentioned, by the way, that the latter appear always to be printed with the longer dimension horizontal, and therefore do not involve the provision for shifting the plane of the mask and film holder.

After this projector had been tested and found satisfactory, it was found that single-frame film strips had been adopted as standard by the educational film libraries, and many of the projectors used for displaying them were only capable of covering the single frame. In the circumstances, the provision for dealing with double frames or glass slides appeared to be superfluous, especially as a much simpler and more compact projector was possible if single frames are exclusively used. Another projector was therefore designed for the latter purpose, and in this case its constructional design was based on that of THE MODEL ENGINEER home cine-projector, certain castings and parts of which could be employed in building it. The former projector was built of sheet metal, and is not difficult for anyone who is conversant with construction in this particular medium; but by using castings, constructional work is very much simplified and speeded up, albeit at the expense of some extra cost of basic material. The optical principles are the same in each case, though the first projector needs a larger condenser, and possibly an objective lens of greater covering power, to cope with the greater maximum area of subject. In both cases, provision is made for the use of low-voltage illuminants,



The single-frame filmstrip projector in course of construction. (See picture of finished projector on the cover of this issue)

which have proved so successful in THE MODEL ENGINEER cine-projector and in common with the latter, accommodation for a transformer is provided in the base; but high voltage lamps up

to 250 W, running direct off the mains, may be used if preferred.

Believing that the second and simpler form of projector, for single frames only, is the one most likely to interest readers of THE MODEL ENGINEER, it is proposed to describe the construction of this one in detail, in preference to the other. If, however, the more universal type of projector is likely to be of general interest, a full description of this can also be furnished ; it is possible that the differences in detail design and methods of construction may justify space for a description of both types. Readers who are interested should, however, inform the Editor without delay, so that the necessary additional text and drawings may be prepared for publication as soon as possible.

From Tin Cans or Cardboard

It is, of course, evident that the form of construction employed in a projector of this type has little influence on its efficiency, provided that the illuminant is efficient for its purpose, and the optical components are of good quality and correctly arranged. One could produce a good projector from tin cans, or even cardboard boxes, the casing being merely a means of holding the optical components in their correct relationship, and preventing the escape of stray light from the illuminant. But most readers will agree that a job of this nature is worth doing well, and that a sound design is conducive to efficiency n operation, even if it does not affect the quality of the optical system. So far as the design of a projector for home construction is concerned, the designer has little control over the selection of optical components, in any case ; the constructor, in the interests of expediency and economy, may have to utilise lenses which were never designed for projection purposes, and in order to cope with eventualities, the maximum range and facility of adjustments are provided in the design. In a mass-produced projector, it may be highly desirable, for convenience of operation, to fit a "pre-focused" type of lamp-holder, for instance ; but this can only be used with a particular type of lamp, and optical components of fixed focal length. While expensive lenses, specially designed for a projector of the specified type, will enable the highest quality of definition to be obtained in projection, it is possible to utilise much simpler and cheaper components to produce results which are so little inferior that they are hardly likely to be criticised by anyone but the most critical scrutineers. In ready-made projectors, one has to pay a very high price for anything approaching optical perfection, and the projectors built and tested by the writer, which have objective lenses adapted from "surplus" equipment, have shown a quality of definition at least equal to that of the more moderately-priced products.

(*To be continued*)

For the Bookshelf

The Modern Diesel. (Eleventh edition.) By Geoffrey Smith. (London : Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1.) Price 7s. 6d.

This book covers the whole field of modern oil engine application, including marine, stationary, transport and aircraft engines, but not miniature engines of the so-called "diesel" type. It has been brought fully up to date in this edition, and contains references to several engines which are not yet in production, but will be available in the near future. Every engine made in this country is described, also those in current production in the U.S.A., in addition to the majority of those built on the Continent. The book contains 277 pages, and is illustrated by over 200 diagrams and photographs.

The Model Boat Book, by G. H. Deason. (The Drysdale Press, Stanbridge, Beds.) Price 7s. 6d.

In its 128 pages this book contains a mass of information of considerable interest and value to the beginner in ship modelling and some of its chapters will be helpful to the more advanced worker. Many types of sailing and power-driven craft are dealt with, particularly the smaller and less ambitious ones. But it is interesting to note that in no case is the hull of the model carved from the solid block, the smallest of the sailing models, a 13-in. sailing Sharpie, being built of three-ply on frames. Practically every method of building a hull is described, although somewhat briefly, including hard chine hulls built of ply on frames, hulls planked in the ordinary way, hulls planked diagonally, and even the papier mache hull and a rather unusual hull built of strips of balsa. Metal hulls are not mentioned. An interesting chapter deals with the popular "M" class yacht but the design shown fails to represent the latest practice in that its L.W.L. is only 39 in. More recent designs show a much longer L.W.L., some designers using practically the whole length of the boat. The river cruiser *Dubarry* is a nice model, and the series of models based on the M.T.B.'s and similar modern naval craft is worthy of note. The various types of power units, i.e. elastic, clockwork, petrol, diesel, steam, electric, and jet are briefly commented on in connection with the various models. The model galleon, however, contains a number of glaring errors which could easily have been avoided without affecting its value as a decoration. The shape of the stemhead is incorrect as also is the curious overhang of the poop and the lateen yard should not have been carried from the mizzen topmast.

The book concludes with designs for an oscillating and a piston valve engine and a final chapter on electric and diesel installations. It is a well-produced on art paper and the illustrations are clear and interesting. The models described are taken from the series of designs issued by the publishers and in each case one of the sheets is reproduced to a reduced scale. Certainly an interesting book.

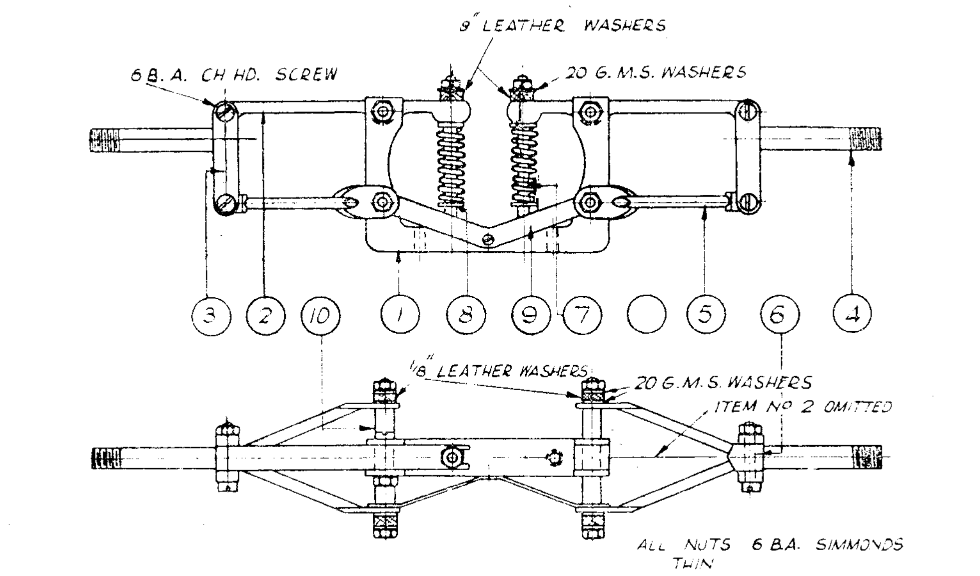
Constructing the M.C.N.
"GRAND PRIX SPECIAL"

by G. W. Arthur - Brand

IN introducing this article to readers of THE MODEL ENGINEER, a few words concerning the subject will help to establish its history to date.

The *Model Car News* " Grand Prix Special " was designed to fill what was considered by many to be a large gap between the American factory-produced racing contraption and the average December issue, construction began with an article on materials required, tools and the making of the pattern or former.

In the January, 1950 issue, the preparation of the material for beating was discussed, followed by a brief discourse on forming and the final preparation of the various sections for welding. The February issue contains an article on fitting



General arrangement of front suspension

British model engineer's conception of a true G.P. type racing car. A great number of you will undoubtedly have witnessed at some time or other, the magnificent spectacle of a full scale event and you will agree with me, I am sure, that it is the sleek yet powerful lines of these cars, rather than sheer speed alone, which combines with the many other details envolved to make the sport a feature of international popularity.

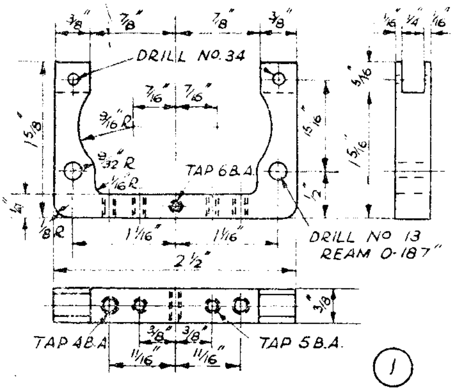
The " G.P. Special," then, should meet the increasing demand for a model to a design which closely resembles its full-sized counterpart, and although not a replica of any known G.P. car, it incorporates a number of features, including the independent wish-bone front suspension to be described later in this article, which lend a degree of realism calculated to satisfy the tastes of even the most sceptical of the true-scale followers. It was first introduced, with general arrangement and exploded drawings, in the November, 1949 issue of *The Model Car News*. In the out, and covers such points as louvres, access panel, flanging, securing clips and rear-view mirrors.

All the above articles are well illustrated by half tone blocks and line drawings, and will be of great assistance to anyone anticipating the construction of this model. A limited number of the four issues concerned, Vol. 4, *The Model Car News*, Nos. 40, 41, 42 and 43, are available and may be obtained on remittance of 6d. per copy, plus 1d. postage. Readers are also reminded that full-sized drawings, (two sheets) are available at 4s. 6d. the set post free.

The Front Suspension

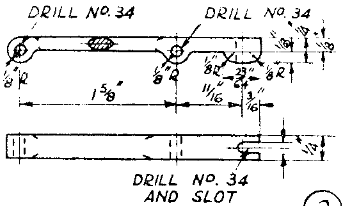
Let us now turn our attentions to the front suspension in this, our final article on the " G.P. Special."

By reference to the G.A. you will be able to form a quick estimate of the material you are going to require and there is every possibility



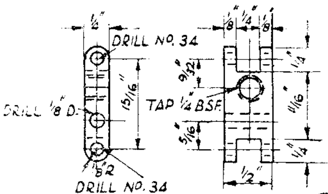
1

BRACKET FOR FRONT SUSPENSION
1 OFF - MATERIAL ALUMINIUM



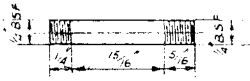
2

TOP SUSPENSION MEMBER
2 OFF - MATERIAL. M.S.



3

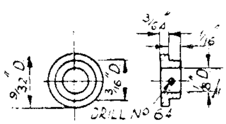
AXLE BEARER
2 OFF - MATERIAL M.S



4

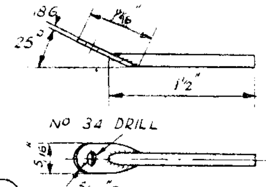
SCREW & BRAZE INTO ITEM No 3

AXLE - 2 OFF - MATERIAL 1/4" S.S.



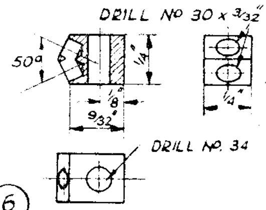
8

SPRING STOP
4 OFF - MATERIAL S.S.



5

'A' FRAME MEMBER
4 OFF - MATERIAL 1/8" D. S.S



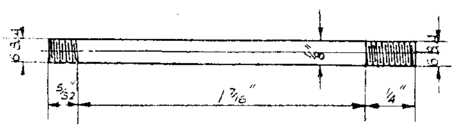
6

BLOCK FOR 'A' FRAME
2 OFF - MATERIAL. M.S.

DRIVE FIT IN ITEM No. 1

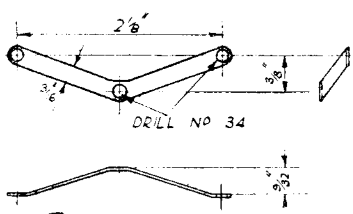
10

MOUNTING PIN FOR 'A' FRAME
2 OFF - MATERIAL S.S.



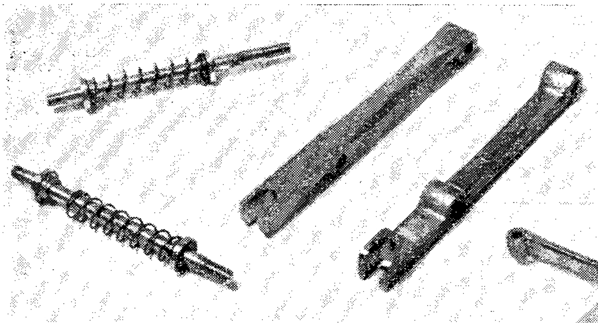
7

SPRING GUIDE
1 OFF - MATERIAL SS

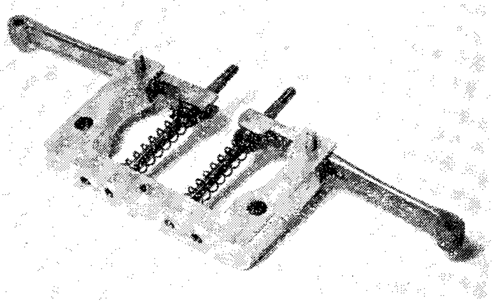


9

TIE BAR
1 OFF - MATERIAL - 20G ALUMN.



Left—Spring-guides fitted with springs and pads, left; with finished top suspension members, right



Below—Fitting the top suspension members

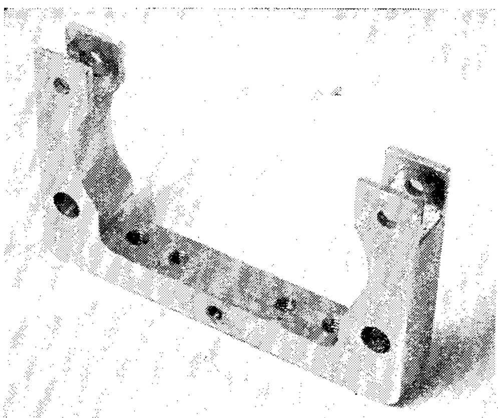
that some of you might even anticipate a few alterations. Well, in this direction I can only say, good luck to you. The design illustrated here and on the original drawings has already been proved, and a great deal of experiment and test was carried out prior to publication; for this reason, the writer is confident of its practicability!

Work should begin on the alloy frame, which may either be milled or hand-cut with an Abra and other selected files. The drawing (No. 1) is quite self explanatory and requires no bolster from added comment. I need only issue a word of warning to the tyro on one or two points, namely the slotting of the vertical limbs to take the top suspension members and the drilling of the Nos. 13 and 34 holes. It is absolutely essential that both slots be in perfect line with each other and that the holes are in all ways parallel, one with the other. With the slots and the No. 13 reamed hole especially, fit is most important and great care should be exercised in order to ensure that, at the final assembly stage, there is no excess of play and absolutely no wobble.

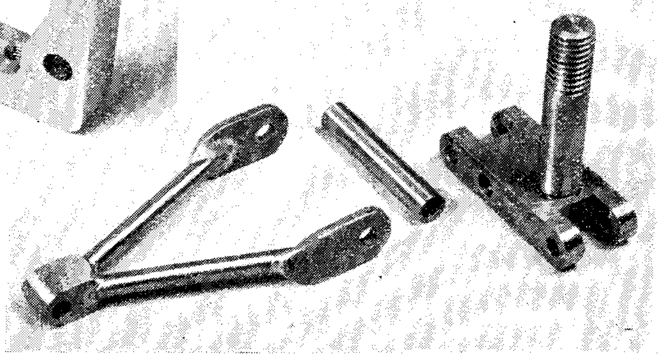
The top suspension members, part 2, are a nice little exercise in sawing and filing, and here again, as in fact with every other component part of this assembly, the importance of care in drilling and slotting cannot be over-emphasized See, also, that both members are *identical* before assembly, as upon these and the wishbones depend the ultimate alignment of the front wheels, provided, of course, that equal care has been exercised in the making of the axle bearers, Fig. 3, to which they attach!

The axles, part 4, should be threaded ¼ in. B.S.F., R.H. and L.H., the R.H. being fitted to the off-side bearer.

The wishbones, or "A" frame members, parts 5 and 6, are quite straightforward, though they require a certain amount of attention if they are going to assemble satisfactorily upon completion. It was found easier to cut the distance tubes, part 10, first. Next, the mounting pin, which slides through this tube, was threaded both ends and the completed members, part 5, securely tightened in position Part 6 was then held in the vice while the aforementioned members were fitted, squared and brazed.



Above—The completely machined bracket

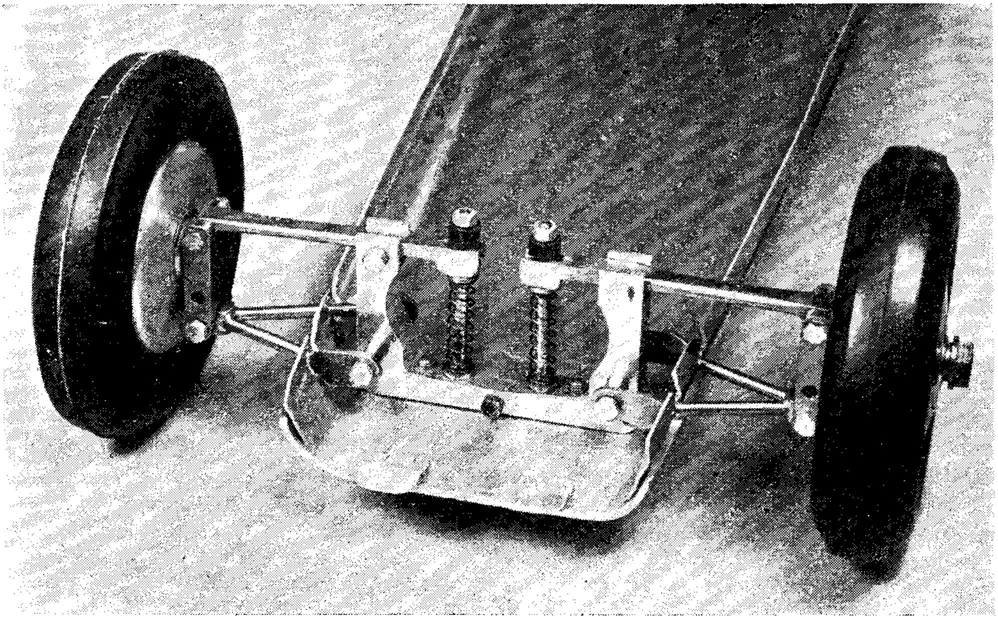


Right—Left, wishbone assembly; centre, distance sleeve, and right, axle assembly

It is very easy, when selecting springs, to choose a pair that are, together, too strong for the work they are required to do. Always remember that, for this particular task, the ironing out of bumps on the average model car track, a soft, well damped suspension is far more efficient than a hard springy one. When dropped from the vertical, that is, standing on its rear wheels—the front end should have no tendency to bounce, though observation should show that the springs have again extended themselves to their allowed distance of travel.

No particular size of spring can be stipulated here, as this will depend upon the type and capacity of engine fitted, the size and type of fuel tank, and, in fact, the whole interior arrangement of the "works."

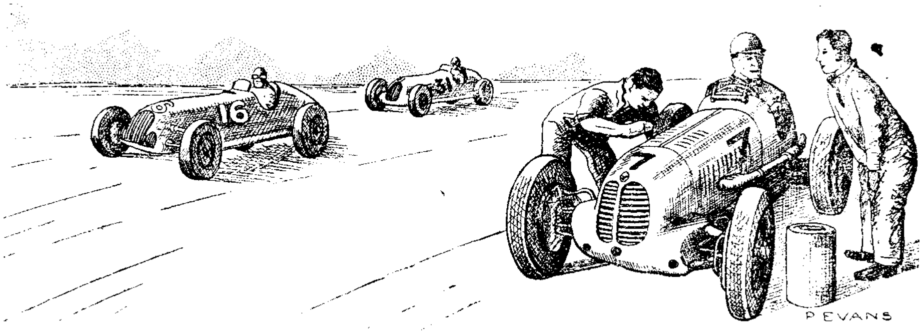
It will be obvious that, to fit this type of unit it is necessary either to have suitable holes cut in the forward body, through which the upper members are assembled, or slots to enable the body to be fitted with the completed unit assembled and *in situ*. The first method was adopted on the prototype, it being found unnecessary to remove the body in order to carry out any adjustments. Needless to add, it presents a far more pleasing appearance and detracts very little in the way of strength.



Installation of the front suspension. Note the rubber rebound pads over the spring actuating finger

Power Units

Although designed to accommodate what is believed to be the largest 10 c.c. engine on the market, the drawing may be suitably scaled down to dimensions which will allow the incorporation of any 5 c.c. or 2.5 c.c. unit. Such cars are already under construction, and at the recent Edmonton M.R.C.C. dinner, at which the writer officiated, he was shown a beautifully finished 2.5 c.c. edition with which the owner hopes to create new records during the coming season.



*TWIN SISTERS

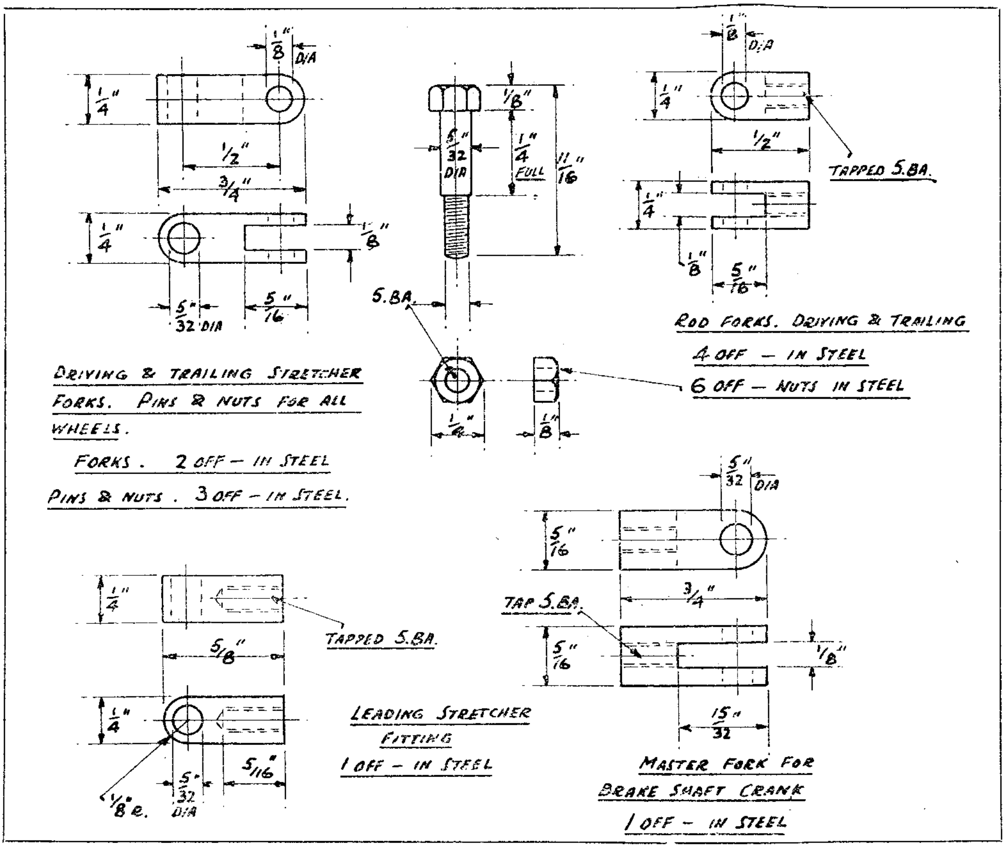
by J. I. Austen-Walton

Two 5-in. gauge locomotives, exactly alike externally but very different internally

WE might as well dispose of the "fiddly" bits first, and by these I mean the forks, links and rods.

I have already drawn attention to the shouldered bolt with a hexagon head and nut. The size of the hexagon is not very important except that its measurement across the corners should not chopping the bolt in two—put very badly perhaps, but it gives a rough idea.

This business of varying the head and nut size in relation to the job to be done, is of the utmost importance in model building, and, coupled with the choice of the correct material it enables us to carry out working detail far more fully,



exceed $\frac{1}{4}$ in. and its width across the flats should not be too near the diameter of the plain portion of the bolt. There is, as you may know a rule regarding the size of the hexagon head in relation to its diameter, but tables seldom refer to special cases where *shear* is imposed rather than *tension* which means, in other words that in some cases there is no tendency for the nut or head to be pulled off, but a distinct leaning towards and more accurately to scale, or *visible* scale.

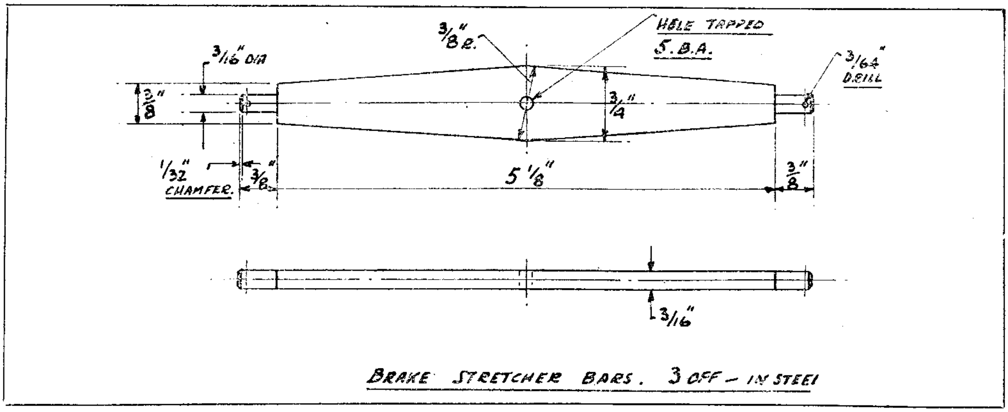
Forks

The only rod fitting that is not forked out is to be found on the leading brake stretcher. This is merely a piece of $\frac{1}{4}$-in. square steel with a hole through one end and a 5-B.A. hole tapped up one end. The forks proper, of which there are seven, have a $\frac{1}{8}$-in. slot milled across one end, and with the exception of the master fork, made from $\frac{5}{16}$-in. square material, they are all in $\frac{1}{4}$-in. square steel.

*Continued from page 219, "M.E., February 16, 1950.

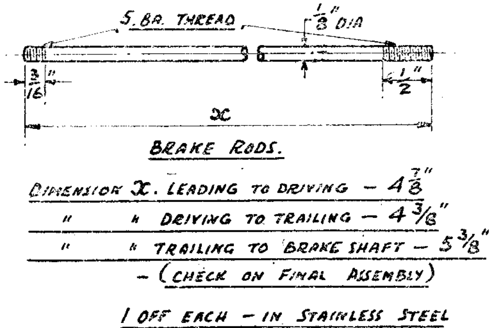
Four of the small forks have a 5-B.A. hole tapped in one end, of each and so arranged that a blind hole and tapping is avoided.

The pins that go in the fork ends are shown with a split-pin hole drilled through the free end. No positional dimension is given for this, and I felt I could rely on the good sense of builders to carry out this operation without guidance.



Brake-rods

There are three brake-rods, and dimensions are given. These lengths have been taken from my own job and are correct, but it must be remembered that even slight differences in the thickness of brake blocks in relation to each other, might well alter these lengths, and that is why I like to make my brake shoes in the ring form



as shown. In any case, a simple piece of $\frac{1}{8}$-in. rod, screwed both ends is hardly likely to upset the building programme, even if it has to be scrapped.

Brake Cylinder

The internal parts of the brake cylinder comprise a piston rod of sorts and a composite piston. I have every sympathy with the folk who complain about the trouble with brake cylinder piston packing, and to get an absolute seal without unnecessary friction can be quite a tiresome job. In our case, the piston is quite shallow. It has to be because of space shortage and the rod portion that connects with the large diameter lower half, passes through an ample clearing hole in the top of the trunk member; so don't think this is a drawing mistake.

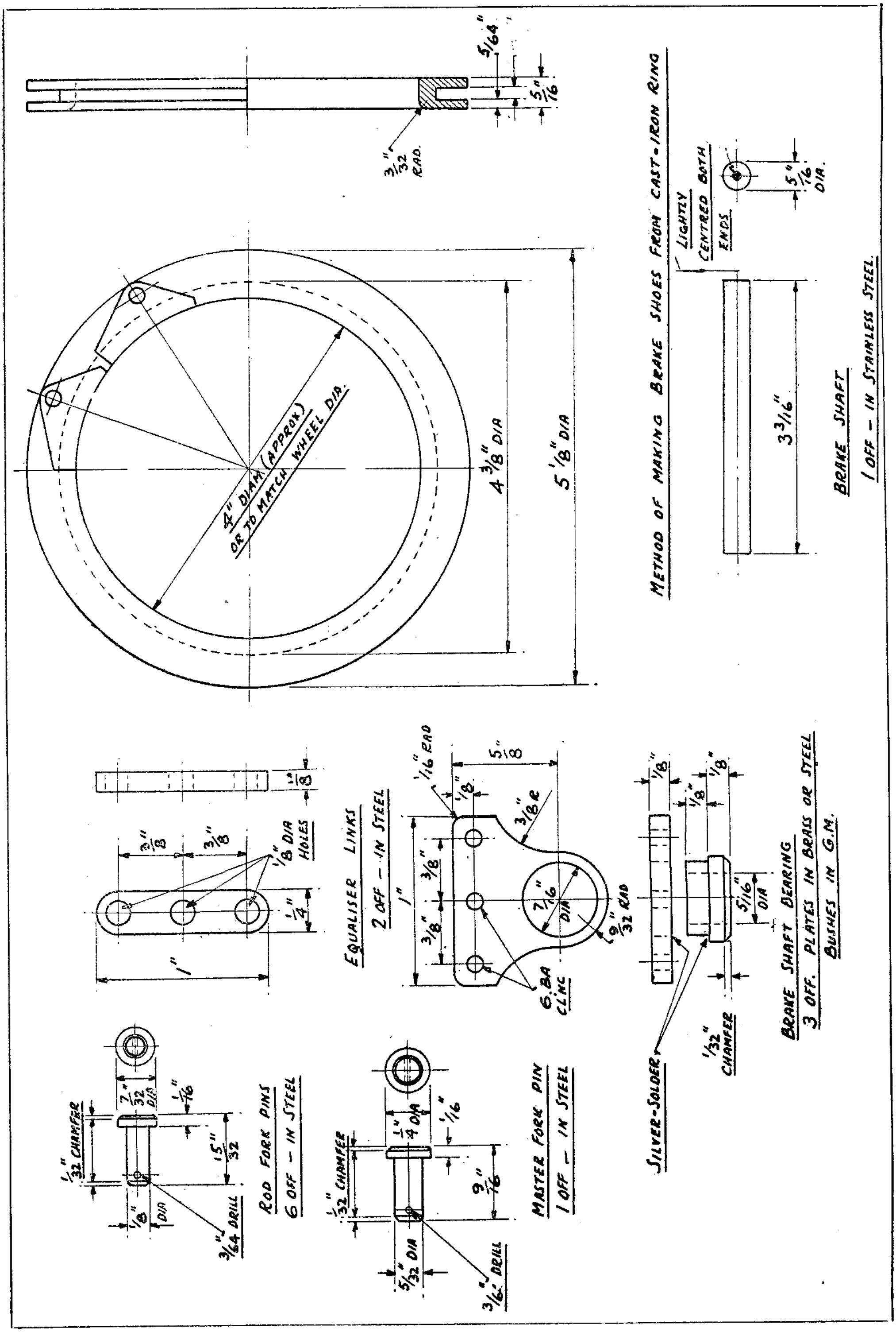
The lower portion of the rod forms a secondary plunger or guide which takes the cross load as well, and is milled right through like a fork. After this operation, a piece is inserted to close the slot at the bottom end, and silver-soldered in. Do not worry about strength at this point, as it does not take any braking load, and merely keeps the working of the piston in step with the crank that works in it. It also makes the plunger or guide more solid. I would not say that, in the absence of a gland or stuffing-box, that concentricity of the plunger with the upper rod, was not important; after all, we are making something that has to work quite sweetly. One way of making sure of this would be to start off with a piece of $\frac{9}{16}$-in. stainless steel rod, making the milling of the slot the first job. Follow on by silver-soldering in the bottom filling piece, and then set it up in the lathe to run truly. Centre the end with the filling piece (it will go in quite neatly) after the end has been faced off. Reverse, face to length and again centre; from then on, treat it as a job between centres, turning large and small diameters in turn, and you will have a concentric part on completion.

The Piston

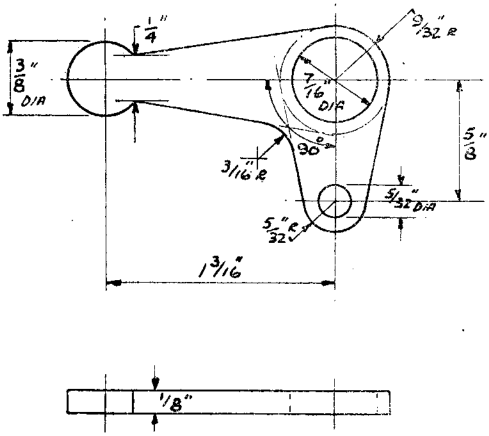
This comprises three parts: the lower body or plate, a leather cup washer, and the top plate and nut combined. This latter part should not be turned to pinch the leather washer tightly in the cylinder, as by so doing you will defeat your own ends for free movement. Pressure alone makes the necessary seal, just at it does on an ordinary bicycle pump.

In time, the leather will perish, but it is surprising how long these will last if given a satisfactory first treatment.

I recommend the following: Take a tin or tin lid, and put a teaspoonful of thick cylinder oil in it. Get hold of some ordinary cellulose paint thinners (pear-drop smell), and add until the oil is quite watery, placing the cup leathers


METHOD OF MAKING BRAKE SHOES FROM CAST-IRON RING
4" DIAM. (APPROX) OR TO MATCH WHEEL DIA.
4 3/8" DIA
5 1/8" DIA
3/32" RAD.
5/64"
5/16"
LIGHTLY CENTRED BOTH ENDS
5/16" DIA.
3 3/16"
BRAKE SHAFT
1 OFF – IN STAINLESS STEEL.
EQUALISER LINKS
2 OFF – IN STEEL
1/8" DIA HOLES
3/8"
1/4"
1"
1/8"
5/8"
1/16" RAD
3/8" R
7/16" DIA
9/32" RAD
6 BA CL'NC
BRAKE SHAFT BEARING
3 OFF. PLATES IN BRASS OR STEEL
BUSHES IN G.M.
SILVER-SOLDER
1/32" CHAMFER
ROD FORK PINS
6 OFF – IN STEEL
7/32" DIA
1/16"
15/32"
1/8" DIA
3/64" DRILL
MASTER FORK PIN
1 OFF – IN STEEL
1/4" DIA
9/16"
5/32" DIA
3/64" DRILL

in the mixture and kneading them about in the thinned oil. I say leathers in the plural because you might as well do one or two spares, and they will keep in good condition indefinitely after this treatment. Leave them in the oil until all the spirit has evaporated which should be about a day. You would never succeed in getting thick oil right into the leather, which is the condition you are after; but dissolved in spirit, it goes



BRAKE SHAFT CRANK
1 OFF – IN STAINLESS STEEL

clean through the leather, remaining after the evaporation of the temporary solvent.

The body or bottom plate of the piston should be an easy sliding fit in the cylinder, without shake, and the guide portion of the piston-rod the same in relation to the bore of the trunk guide.

Brake Shaft Crank

The brake shaft crank is fabricated from steel-plate and turned steel sleeves or bushes. The plate portion in $\frac{1}{8}$-in. material I would prefer to see in stainless steel; if you happen to have a suitable scrap of 3/32-in. plate, or thereabouts, in this material, then you can use it. There is more than ample strength in the $\frac{1}{8}$-in. lever, but it does give just a little extra bearing face where the disc end runs in the trunk guide.

If, before the silver-soldering together of the three parts, you are a little apprehensive about the thin wall surrounding the large hole in the crank, then leave a surplus, filing it to the finished profile after brazing. Don't file this flat with the bush level on each side, but leave the $\frac{1}{16}$-in. fillet or ridge showing like a rib all round, which makes it look more correct.

The two holes for the 3/32-in. pins can be put in where you like; they could also be countersunk slightly, and the pins riveted over and filed flush, with the shaft projecting the $\frac{1}{4}$ in. as shown. You can do this job right away when brazing and cleaning up is over, as it does not have to be dismantled any more.

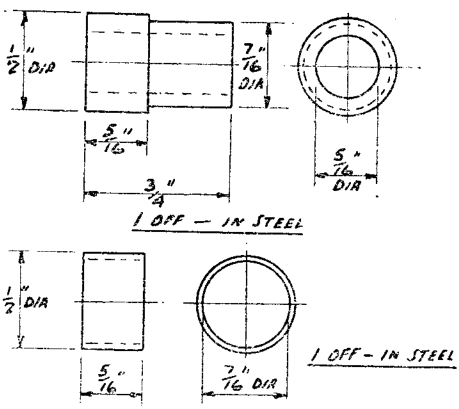
A Mystery Solved

Quite by the way, the fitting of the brake shaft bearings solves the mystery of the appropriate drop in the frames where these are bolted on, but one friend asked me why the opposite or left-hand frame had the same provision for a bearing that wasn't there. I told him that it enabled the driving and brake position to be reversed in the case of export models—I hope he didn't think I was pulling his leg! but it *does* rather look like it, doesn't it?

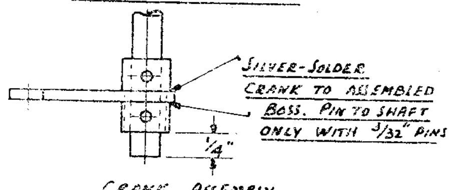
I had a commercial-type Ford van of post-war design, and this had two starting handle apertures in the radiator grille, for the very same reason. One day, a man asked me what they were for; I told him. "Blimey," he said; "I've had enough trouble with one —— handle without having two of the —— perishers."

Assembly

Having drilled the holes in the rear diaphragm and tried up the cylinder for a check, take the piston-rod and thread it through the trunk portion of the cylinder. Before putting the piston body on the rod, put a little jointing round the shoulder to stop any leakage past the central hole. Now push the top plate nut and leather



BUILT UP CRANK BOSS



CRANK ASSEMBLY
(VIEW FROM ABOVE)

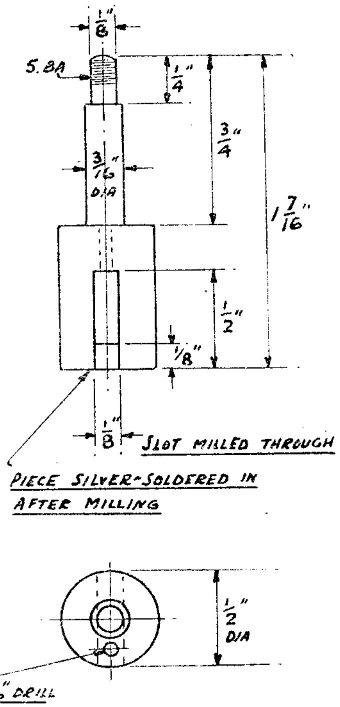
cup washer down from the top of the cylinder, and feed the piston-rod through and securing with a few turns of the nut. Bolt the lower cylinder trunk to the cylinder (no jointing required) and try sliding the piston and rod up and down. You will have to make up a simple pin spanner from an odd piece of steel-plate

(useful to keep for this job, in the tool kit) which may now be used to tighten up the top-plate. To prevent the lower part twisting round, insert an odd piece of steel-plate through the slot, inside and out, and try out the sliding motion until the nut is quite tight. If everything is true and square, you should be able to blow the piston down with nothing more than lung power via the feed pipe.

Leaving the inner and outer slots in line, make up the top joint and cover, and bolt to the diaphragm, the slot facing the back. Erect the brake shaft, after tucking the long arm of the crank into the slot. Should the arm of the crank rub on one side of the outer trunk guide, I will turn my back while you set (sounds better than "bend," doesn't it ?) the crank arm to clear the sides of the slot.

Now join the hangers to their respective stretcher bars, and the pairs to their frame hangers, and bolt on the linkage. The setting of the brakes is done in the following way :—

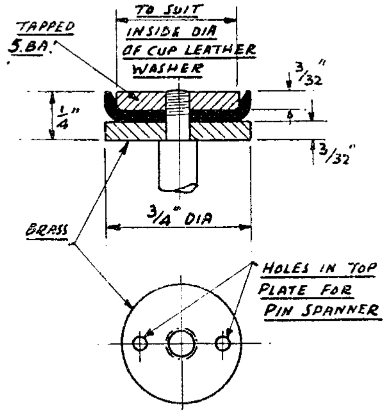
With the leading and driving pairs of shoes in contact with the wheels, and the front rod in place, the equaliser link should be vertical as shown on the drawing ; adjust the rod fork



BRAKE CYLINDER PLUNGER
1 OFF – IN STAINLESS STEEL

until this is so, repeating the operation for the driving to trailing pair of wheels. Now adjust the main brake rod until the piston is $\frac{1}{8}$ in. from the bottom of its stroke with the brakes on.

Stand the engine on its wheels, loading it down evenly to its running position ($\frac{3}{16}$ in. between the bottom of the axle boxes and the keeps, leading and driving only) and try working the brakes by turning the crank and shaft. If the brakes go on without the piston bottoming, it is correct, and the lock-nuts can be done up.



BRAKE CYLINDER PISTON
ASSEMBLY – 1-OFF

Now release the brakes fully, and have a look round to see that there are no shoes rubbing on the wheels. If there is rubbing taking place, you may have filed too much off the check peg inside the shoe ; remedy—new peg. If, when you apply the brakes, the bottom of the shoe makes contact with the wheel stiffly and without give, it may be either the peg left too long or the shoe working tightly on the hanger. Remedy : free the shoe and/or file the peg back a little and try again.

You need not be afraid of losing your brake setting by removing stretchers and hangers bodily, as once the lock-nuts have been done up you cannot alter the setting, and adjustments like those mentioned can be made as often as you like. Only in the case of brake shoes not mating properly with the wheels, will it be necessary to check over the brake rod adjustments.

Washers

Finally, put all brake pins in from one side of the engine, it does not matter which side, and try to drill split pin holes reasonably close to the forks, so as to avoid unnecessary float. Some builders like to have washers between the split pins and the fork sides ; I do myself, but the drawing makes no allowance for this addition. If, therefore, you decide to add these, turn your pins to the extra length required, just plus the thickness of the washer you intend to use, say 1/32 in on the length shown. The small forks should have washers $\frac{3}{16}$ in. diameter, and the one large fork a $\frac{1}{4}$ in. diameter washer. Don't leave long lanky ends to the split pins ; half the diameter they go through, or even less, should be enough.

You might also like to drill tiny countersunk oil holes in the three bearings for the brake shaft; this is another thing not shown on the drawing.

And now for the "Minor" builders and "hand brake only" brigade. All the above remarks would apply, and only the brake cylinder and crank would be left out. In place of the crank, turn up a plain bush, $\frac{3}{4}$ in. long × $\frac{1}{2}$ in. diameter with one 3/32-in. pin to key it in place.

And the "paint as you go" folk? Well, if you have made the hangers, stretchers, links and rods in stainless steel as suggested, you may not feel inclined to paint them at all. The fact remains that so far as appearances go, it would look all wrong and, to follow the prototype to the last detail, one would have to black the lot.

I suggest a medium course, treating the brake shoes as previously suggested, and painting in dull black, hangers, stretchers, brake shaft crank and bearings, this would leave all the links, rods and forks in the bright condition. If you have used ordinary steel for the latter parts, it would be wiser to paint the whole lot.

As for the cylinder unit itself, this should also be black, I think, even though it is in a red paint region, but you can please yourselves about this. I would not lag the cylinder; it is placed quite near the ashpan and should keep reasonably warm when the engine is in steam.

Anything else not mentioned? Just one thing: you will see that a $\frac{1}{16}$-in. hole is to be drilled down through the crown of the steel trunk guide member, breaking out into the slot. This is to keep the lower chamber of the cylinder free to atmosphere, and to provide a leak-away for condensate that is bound to collect.

The next constructional item will be the coupling-rods (I know you have been *longing* to make these), and, following a promise I made about advance information regarding material, you will need 2 ft. of 1-in. × $\frac{1}{4}$-in. flat bright steel bar, anything *other* than mild-steel if you can manage it. If you have set your heart against stainless-steel at all costs, then get some cast-steel bar in the black form, making the $\frac{1}{4}$ in. dimension $\frac{5}{16}$ in. to allow for cleaning up.

(To be continued)

Change-wheel Trains for B.A. Threads

by F. C. R. Douton

In very few cases is it possible to cut accurate B.A. pitches with only the ordinary change-wheel equipment. The accompanying table has been prepared from data and suggestions published in THE MODEL ENGINEER, and includes a selection of the best results so far given, together with some original calculations.

In THE MODEL ENGINEER for April 29th, 1920, Mr. Chas. E. Heath gave some very useful tables for both metric and B.A. threads. This was followed on May 16th, 1935, by Mr. W. E. Davies, who described his methods, and on October 17th, 1935, Mr. E. A. Hanney gave further valuable information.

CHANGE WHEEL TRAINS FOR B.A. THREADS
LEAD SCREW 8 THREADS PER INCH.

B.A. No.	PITCH M/M.	EQUIV. T.P.I.	WHEELS. DRIVERS.	WHEELS. DRIVEN.	ACTUAL T.P.I. CUT
0	1·0	25·4	21 30 30 46 65 20 20	40 50 60 73 30 50 55	25·3968 25·3913 25·3846
1	·90	28·2	20 35 21 36 45	38 65 40 50 60	28·228 28·218
2	·81	31·4	20 35	50 55	31·428
3	·73	34·8	20 30 40	38 50 55	34·83
4	·66	38·5	20 20	35 55	38·5
5	·59	43·0	20 20 35 20 30	25 50 60 50 65	42·857 43·3̇
6	·53	47·9	20 20	40 60	48·0
7	·48	52·9	20 20 40 20 20	35 50 60 44 60	52·5 52·8
8	·43	59·1	20 30 40 20 20	45 60 65 50 60	58·5 60·0
9	·39	65·1	20 20	50 65	65·0
10	·35	72·6	20 20 30 20 20	40 45 60 50 73	72·0 73·0

In the case of the Drummond $3\frac{1}{2}$-in. lathe with a leadscrew of 8 threads per inch, the number of teeth on most of the wheels is a multiple of 5, though a wheel with 38 teeth is also included in the set. Some models include two special wheels with 46 and 73 teeth for use when cutting metric threads.

For this purpose, the writer uses a 21 wheel, see THE MODEL ENGINEER for November 29th, 1934. The Drummond 4 in. round bed lathe has a leadscrew of 10 threads per inch, and the wheel teeth are multiples of 4. These wheels all have a $\frac{5}{8}$-in. hole, boss $\frac{5}{8}$ in. thick, teeth $\frac{1}{2}$ in. wide, 14 d.p. and are interchangeable.

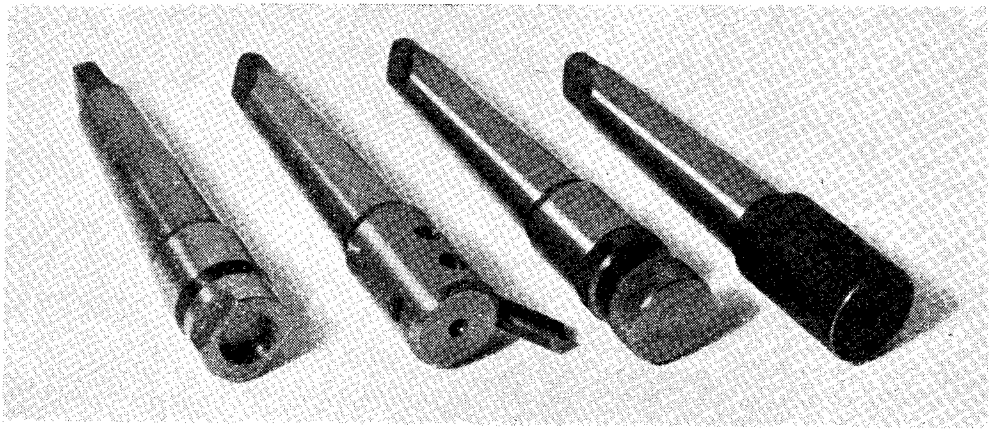


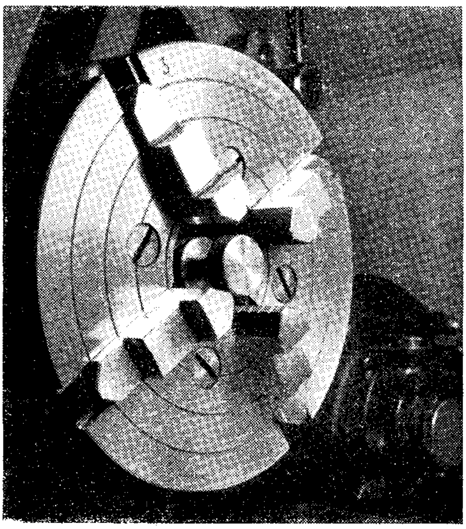
Photo No. 1. The three finished attachments and a plain taper shank

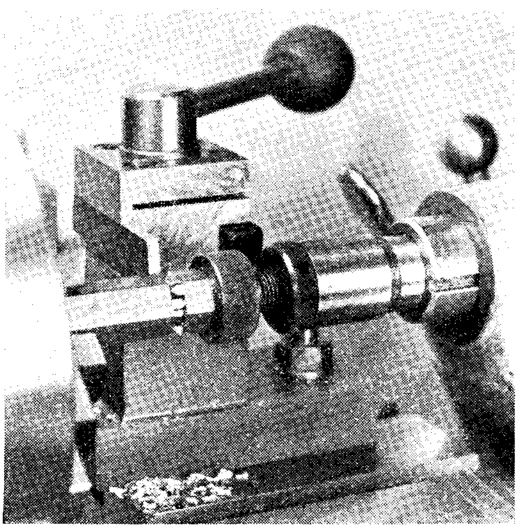
SOME LATHE ATTACHMENTS

by R. E. Blakeney

WHILST buying some items for the workshop, the writer noticed some No. 2 Morse taper shanks with a generous plain portion at the end. It seemed likely that these could be put to some very good use, so four were purchased forthwith, though it must be admitted that at the time on definite plans had been made for their use.

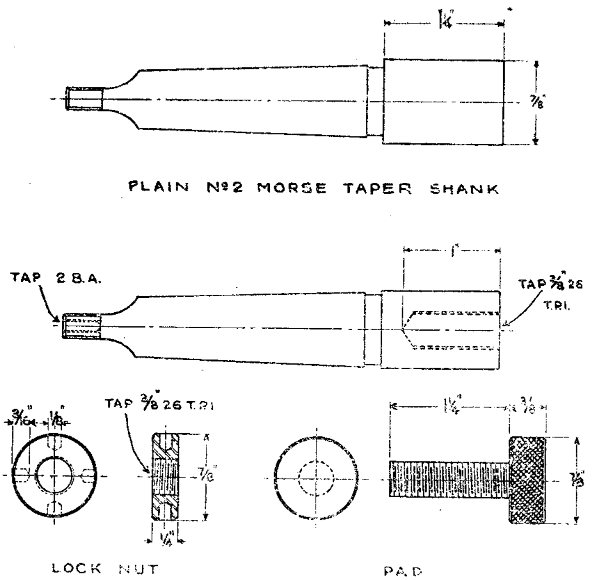
A short while afterwards some odd size nuts had to be produced, and some form of stop was needed to determine their size, so one of the shanks was made into an adjustable stop. Photograph No. 1 shows a shank in its original state, as well as the three attachments which were subsequently made. It will be seen that the adjustable stop consists of nothing more than a pad which is screwed into the end of the shank, and a lock-nut, the opposite end of the shank





Left: Photo No. 2. The adjustable stop in use in the lathe mandrel. Right: Photo No. 3. The adjustable stop fitted in the tailstock

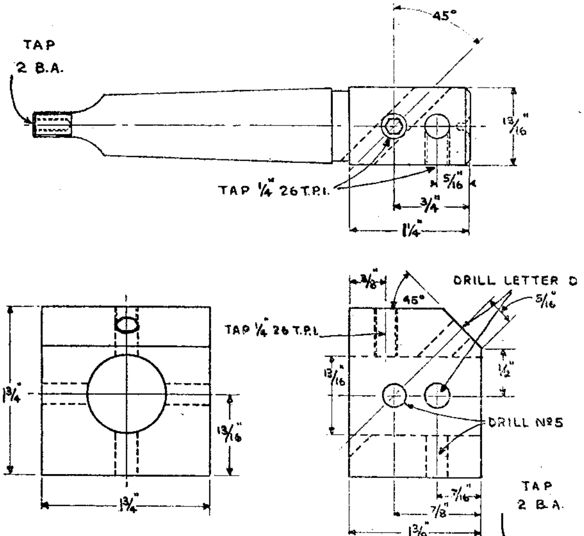
being drilled and tapped to take a draw-bolt which passes through the lathe mandrel or tailstock barrel. In most cases these shanks are hardened, as far as the taper portion is concerned, at any rate, and before any work on them can be undertaken they have to be softened. When this has been done the drilling and tapping can be carried out. The shank was, therefore, duly softened and set up in the four-jaw chuck with the taper part outwards, and set to run true, after which it was drilled to a depth of $\frac{3}{8}$ in. with a No. 26 drill and tapped 2-B.A. A length of 2-B.A. screwed brass rod was then fitted to the shank, which was inserted in the lathe spindle ready for turning. The outside diameter was reduced to $\frac{13}{16}$ in., and the end faced and centred, after which it was drilled $\frac{5}{16}$ in. to a depth of 1 in. and tapped $\frac{3}{8}$ in. 26 t.p.i. The pad and lock-nut were made from a short length of $\frac{7}{8}$ in. round bright mild-steel, and after the threaded part had been finished, the knurling for both items was carried out at one go, allowing a little extra for parting off. The pad was then parted off, and the remaining piece of steel faced, centred, drilled and tapped $\frac{3}{8}$ in. 26 t.p.i. also. In each case a light chamfer was cut on both sides of the pad and nut before parting them off. Finally, the pad was case-hardened and polished. Photographs Nos. 2 and 3 show the stop in use.



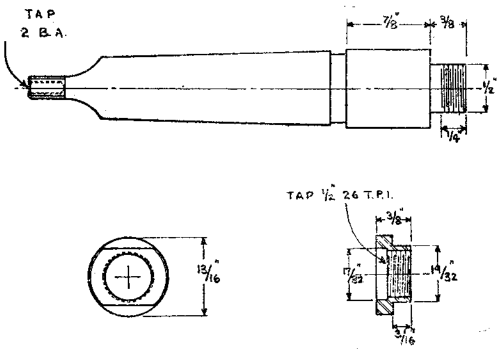
Adjustable stop

The second shank formed the basis of a cutter holder which fits the taper of the lathe spindle, and is held in position in a similar manner to the first one by a draw-bolt. The cutters can be held in two positions, at right-angles to the axis of the lathe mandrel, or at 45 deg., the latter position being used for facing. The alternative positions are shown in photos Nos. 4 and 5. The preliminary machining operations were as for the adjustable stop, and the finished portion was left $1\frac{1}{2}$ in. long and $\frac{13}{16}$ in. diameter.

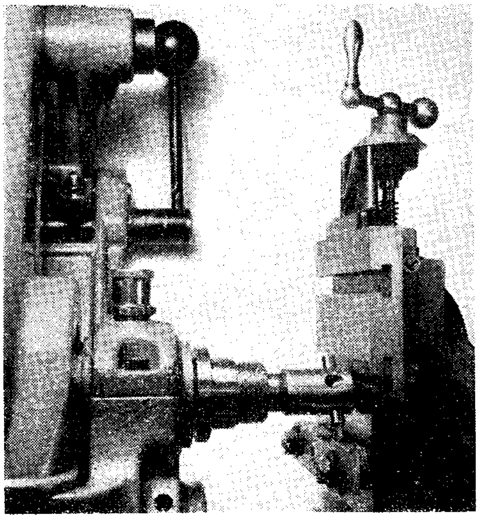
For drilling the hole at 45 deg., a block of scrap brass was bored a tight push fit for the parallel part of the shank, and a flat was formed on it at the required angle; at the same time a hole was drilled and tapped $\frac{1}{4}$ in. B.S.F. to take a grubscrew as shown in the sketch. The centres for the cutter holes were then marked off as shown, and drilled with a letter "D" drill. The holder was then inserted in the block of brass and brought into position for drilling the hole at 45 deg., being

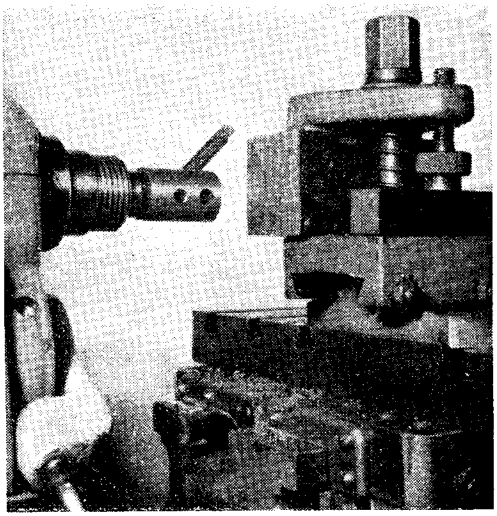


Above: *Cutter holder.* *Below*: *Drilling jig*



Saw arbor





Left : Photo No. 4. The right-angle cutter in use. Right : Photo No. 5. Facing a piece of mild-steel with the 45 deg. cutter

secured in this position by the grub-screw. It was then set up in a machine vice and drilled with a letter "D" drill, and finished with a $\frac{1}{4}$-in. reamer. In a similar way the hole at right-angles was drilled and reamed. It will be seen that the cutters are held in position by two socket-headed $\frac{3}{16}$-in. B.S.F. grub-screws, the holes for which are drilled by using the appropriate hole in the jig.

The cutters were made from short lengths of silver-steel filed roughly to shape, and then hardened and ground.

The third attachment to be made was an arbor for small slitting saws, which will take saws up to a thickness of $\frac{1}{8}$ in. The initial stages in its construction were identical with the others and do not need repeating. Having reduced the outside diameter to $\frac{13}{16}$ in., $\frac{3}{8}$ in. of this portion were reduced to exactly $\frac{1}{2}$ in., of which $\frac{1}{4}$ in. was screwcut 26 t.p.i. The nut was machined to the dimensions shown in the sketch, and recessed to a depth of $\frac{1}{4}$ in. by 17/32 in. diameter. The two flats were produced by mounting the nut on a small stud, which was bolted to the face of a vertical slide, and traversing it across an end and face cutter held in the self-centring chuck. No originality is claimed for any of the attachments described, but they are certainly useful and inexpensive to construct, and can be relied upon successfully to replace makeshift arrangements which are due for retirement.

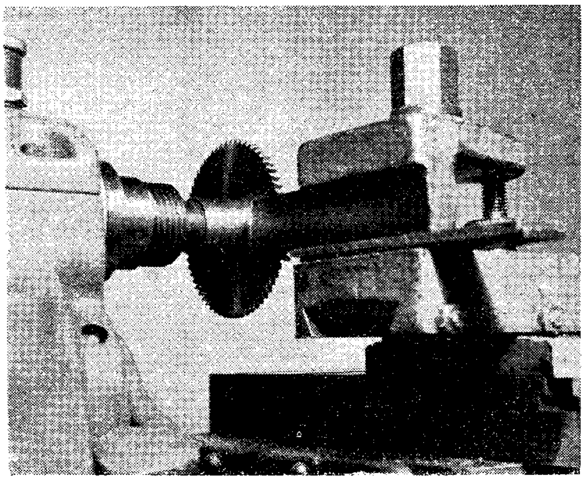


Photo No. 6. The slitting saw arbor in use

An Unbreakable Three-Pin Plug

An excellent unbreakable three-pin rubber plug is being manufactured by W. W. Haffenden Ltd., Richborough Rubber Works, Sandwich, Kent, which will fill a long felt need in many home workshops. Of handy dimensions and completely insulated, the unit will resist almost any amount of rough handling. For two-pin sockets the large pin may be removed.

Repair that Watch!

by J. H. Drake

QUITE a number of model engineers will have an old watch tucked away in the back of the tool cabinet. In fact, I have yet to meet a model engineer who hasn't! The majority will tackle a clock, and make a job of it, but stop short when brought up against a watch.

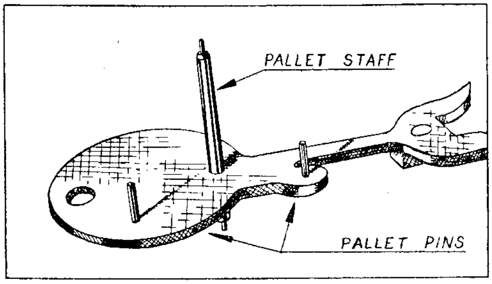


Fig. 1

The repairs that are outlined here do not apply to watches that have bounced three times on the garden path (although it is ever a source of wonder as to how great a battering the average cheap watch will take), nor do you need elaborate tools to carry them out.

Professional watch repairers will not, as a rule, bother with the type of watch that I am about to describe. With these people the time-money factor is an important consideration, and they cannot work at a loss any more than Mr. Brown the greengrocer or any other tradesman.

The tools needed are a pair of tweezers, a small screwdriver (a needle ground to shape and held in a small pin-vice is a very useful tool) and probably an eyeglass.

Taking a gent's wrist watch of a non-jewelled

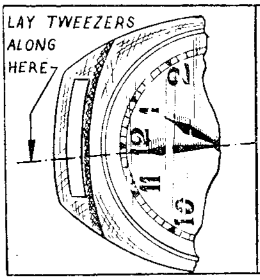


Fig. 2

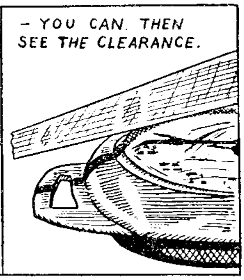


Fig. 3

"pin-pallet" variety as an example, you will find the lever takes its action from the escape wheel through two upright steel pins set in the brass pallett (see Fig. 1).

Before opening the watch, examine the motion of the hands. Does the minute hand remain the same distance from the dial throughout its full sweep? Does it pass over the hour hand with a good clearance? Does the hour hand touch the second hand? Does the minute hand or the centre-post touch the glass?

If the minute hand touches the glass, there will probably be a marking on the glass if it is tilted at various angles to the light.

The usual quick test for clearance is to hold the watch facing upwards; lay a straight-edge along the minute hand (the edge of the tweezers will do), then turn the watch sideways, still keeping the relative positions of the watch and tweezers. It is then easy to see, and form a good judgment of, the clearances (see Figs. 2 and 3).

If these points are not correct, the hands will have to be bent with the tweezers until they clear. (Much raising of eyebrows and "tut-tutting" at this statement, but in fact the bending required is very small, and this *is* how the repairer does it!)

Very often the hole in the minute hand has no thickness to speak of, holding on by sheer will-power as it were, and in this case the hand can be tilted to the required position without bending.

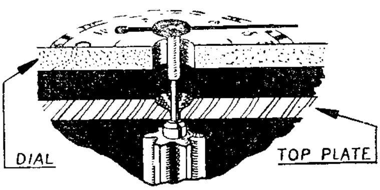


Fig. 4

All being well above the dial, the movement can be taken out of the case. For the majority of these watches the case is made in two parts.

The top comprises the glass, the bezel, and the lugs for the strap, while the lower half is merely a metal cup that holds the movement.

The winding shaft lays in a vertical slot, and this enables the "works" to be removed without first removing the winding stem.

Having gently lifted the movement out of the case, the next step is to remove the dial.

The second hand should be removed and put in a safe place. It should be remembered that the second hand is made on a long brass "pipe" that is a push fit on the elongated pivot of the fourth wheel (see Fig. 4).

Knowing this, it will be obvious that a straight even pull is required.

Next, the minute hand is removed and reasonable care is needed here. If one is too heavy, the minute hand is liable to "fly," and let it be said in passing that these things possess amazing aerobatic capabilities. One sees the hand zooming towards the radiogram, but it is eventually found under the hall stand (about three weeks later).

We don't have to worry about the hour hand, because this will come away with the dial.

At two points on the circumference of the dial will be seen two very small screws. Remove these, and the dial is free. Place all these loose parts and screws together in a safe place.

On the top plate of the watch will be found a small "idle wheel" that is normally in mesh with the hour wheel (this is the wheel to which the hour hand is attached that came away with the dial).

This idle wheel is called the "minute wheel." Remove this and if the watch has a loose cannon pinion, remove that also. There is nothing else now that will fall off the movement, and it can now be turned about to our heart's content without fear of losing things.

The next item on the agenda is to let the mainspring right down. This must be done without shock. Sharpen a matchstick to a point and with this, ease the click (pawl to you) out of mesh with the winding wheels, holding the winding button firmly with the other hand. You will then find that you can let the spring down through the winding button.

When all power is off, the balance can be removed. Take out the screw from the balance cock and lift the balance cock gently. The hairspring is quite capable of supporting the weight of the balance wheel, provided the wheel is not caught up anywhere.

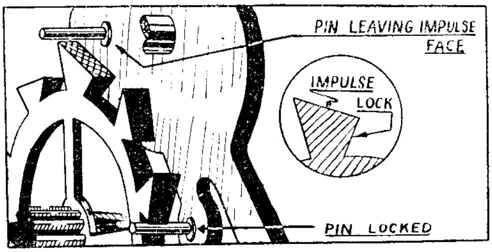


Fig. 5

Lay the balance in an empty matchbox or small cardboard box. The lever is the next part to be removed.

Unscrew the cock as before, carefully remove it, then remove the lever by holding the staff with tweezers. Lift the lever as far as possible to clear the bearing hole, then withdraw sideways.

If the mainspring was not let right down, it would chop the pallet pins off at this juncture.

However, having removed the lever, you can give the winding button half a turn, and then watch how the train behaves; the escape wheel should kick back a little when the train stops. This shows the necessary freedom in the wheels.

If you do not see the kick back at this stage, however, do not worry unduly, because the watch will have to be cleaned before it is finally put in service.

We find that the train is quite in order, and proceed to test the action of the lever.

A few words on the action of the lever will not come amiss here.

The pallet pins span three teeth of the escape wheel. They receive impulse from the wheel, and also lock the wheel *immediately* after receiving the impulse. This is very important to remember.

If the forward pin has just left the impulse face of the tooth, the rear pin must be in a position to lock the wheel. Furthermore, the locking faces of the teeth are so shaped that the pin is drawn still further towards the centre of the escape wheel (see Fig. 5).

Below the horn of the lever will be seen a pin, called a guard pin, safety pin or dart. This only comes into operation when the watch receives a shock, and the impulse pin is shaken off the locking face. It stops the lever swinging across to the other side of the balance staff before the impulse pin in the wheel is ready to take it across.

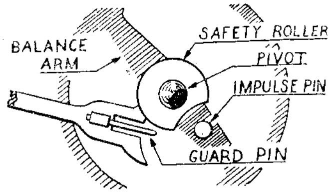


Fig. 6

In normal working, the guard pin passes a crescent on the safety roller. These items can be seen in Fig. 6.

If the pallet pin is shaken off the locking, the guard pin presses on the safety roller to prevent the lever swinging across, and the friction of this action slows the balance wheel down. If the lever consistently miss-locks, the watch will stop, and this is the most common fault in the pin pallet movement.

As mentioned above, the escape-wheel teeth are so shaped that they draw the pallet pin towards the centre of the escape wheel, or in other words, they keep the safety pin *away* from the safety roller. This is called the "draw."

The lever action was invented by an Englishman, Thomas Mudge, who lived from 1715 until 1794, but there was no draw on the lever, and this factor held up the development of the lever for a number of years.

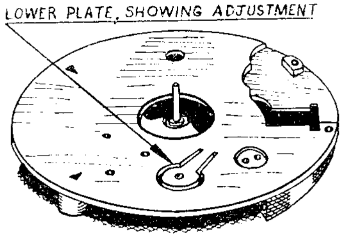


Fig. 7

With a jewelled lever, the draw is obtained from the shape of the teeth and the slope of the pallet jewels.

All this may sound rather formidable, but to test for correct action, the procedure is quite simple.

(*Continued on page* 279)

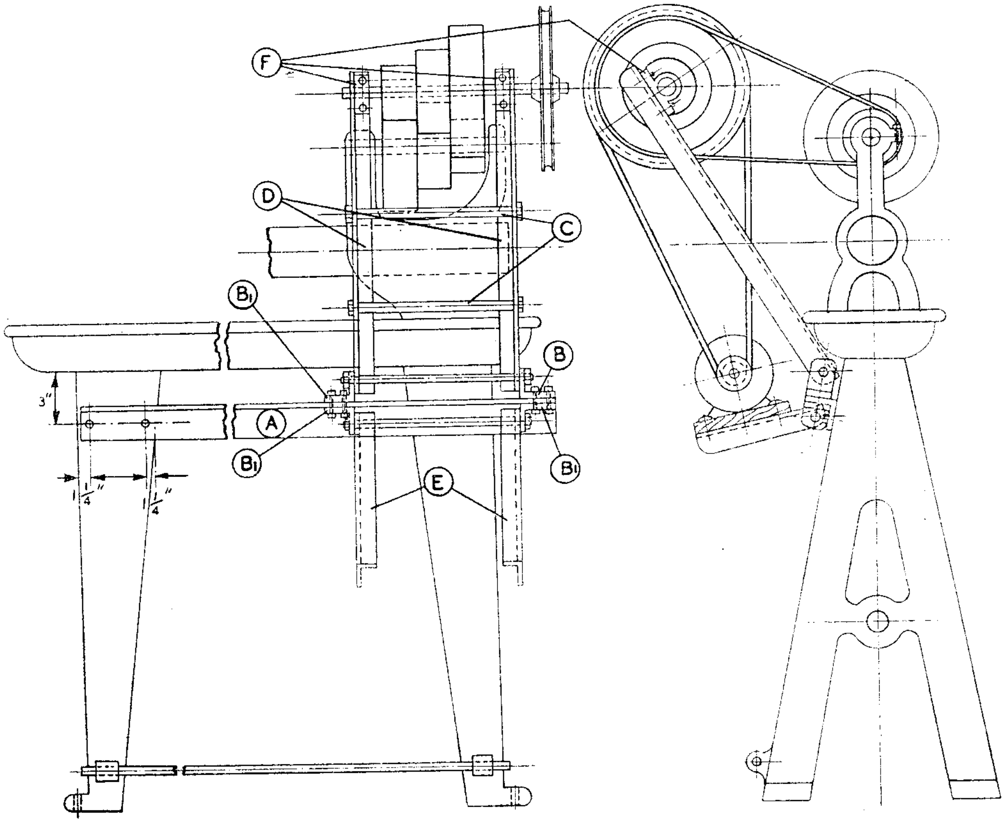
Motorising the 4-in. Drummond Lathe

by W. R. Silvester

THE initial step in carrying out this conversion was to cut a 2 ft. 8 in. length of 2 in. × $\frac{1}{8}$ in. angle iron. Facing the rear of the lathe I marked off and drilled two $\frac{1}{4}$ in. holes in each leg, 3 in. from the top and $1\frac{1}{4}$ in. from their outer edges. The length of angle was then clamped to the legs with the adjacent flange uppermost, the holes coincident with the centre lines of the vertical member, after which it was marked off, drilled and bolted to the legs (*A*).

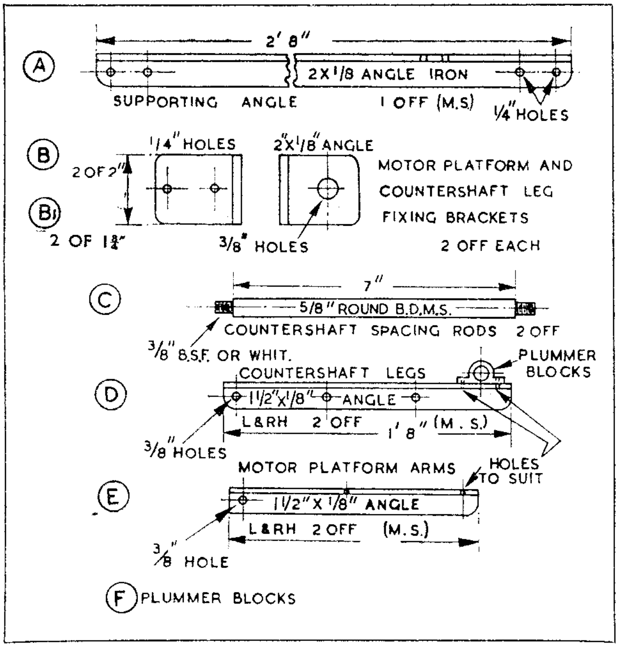
A further length of angle iron was next cut into four pieces, two being 2 in. and the others $1\frac{3}{4}$ in. in length. In the centre of each of the 2 in. brackets and on one flange only were drilled two $\frac{1}{4}$ in. holes spaced equally apart to enable them to be bolted to the supporting angle. One of these brackets was placed on the change-wheel end of the fixing angle, with the vertical flange facing to the left and the drilled flange against the supporting angle. Two $\frac{1}{4}$ in. holes were marked off and drilled in the supporting angle, and the angle bracket bolted to it. The other 2 in. bracket was drilled and bolted to the supporting angle with its vertical flange facing the first bracket, so that there were $7\frac{1}{4}$ in. plus clearance between the two faces.

The two shorter brackets were drilled and bolted in exactly the same way directly underneath the top ones, and the four brackets bolted together with the same $\frac{1}{4}$-in. bolts and nuts through the supporting angle. They were then removed and the plain flanges marked by scribing from corner to corner and centre-popping where the lines crossed. On these points were drilled $\frac{3}{8}$ in. holes, and when the four brackets had been rebolted to the fixing angle the whole was mounted on the legs of the lathe.



After cutting off two $8\frac{1}{2}$ in. lengths of $\frac{5}{8}$ in. diameter mild-steel bar, I chucked each piece and turned down the ends to $\frac{3}{8}$ in. diameter for a length of $\frac{5}{8}$ in., threading each end $\frac{3}{8}$ in. Whitworth. Readers can use any $\frac{3}{8}$ in. thread to suit.

For the countershaft legs, I cut off two pieces of $1\frac{1}{2}$-in. × $1\frac{1}{2}$-in. angle iron, each 1 ft. 8 in



long. One piece was marked $\frac{3}{4}$ in. up from one end and centre-popped on that point also on three successive points 6 in. apart, all of which were drilled for $\frac{3}{8}$-in. bolts (*D*). This and the other piece of angle were clamped back to back using the first as a template to drill the second. The spacing-rods (*C*) were then bolted to the two sets of inner holes of the countershaft legs (*D*), as shown in the drawing. A $\frac{3}{4}$ in. diameter bolt, $7\frac{3}{4}$ in. long, was used to secure the legs to the angle bracket (*B*) on the lathe, with the undrilled sides of the angles against the headstock and pointing towards each other.

Having obtained a pair of commercially made plummer blocks of $\frac{5}{8}$ in. bore, I clamped them to the top end of the countershaft legs and after using a piece of $\frac{5}{8}$ in. round bar as a mandrel to align them, drilled through and secured the plummer blocks with suitable bolts and nuts (*F*).

A three-step pulley to match the lathe pulley was obtained and fitted to the countershaft, also a suitable driving pulley. The countershaft end-play was taken up by inserting short lengths of $\frac{5}{8}$ in. bore tubing each side of the cone pulley after its alignment with the lathe pulley had been set.

The motor platform was constructed in the following manner. Two 12 in. lengths of $1\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. $\times$ $\frac{1}{8}$ in. were clamped back to back and a $\frac{3}{8}$ in. diameter hole was drilled through both $\frac{3}{4}$ in. from one end. The untouched flanges were then drilled as per drawing (*E*) and both platform arms were fixed to the lower brackets (*B*) on the supporting angle (*A*) by means of a $\frac{3}{8}$ in. $\times$ $7\frac{3}{4}$ in. bolt and nut. A wooden platform, 8 in. $\times$ 8 in. $\times$ 1 in. approx., was bolted across the two angles using the $\frac{3}{16}$ in. diameter holes for fixing. The motor was then mounted on the block of wood.

Repair that Watch ! (*Continued from page 277*)

Replace the lever in the movement and screw the cock down again, being careful of the fact that you have really placed the pallet pivots in their holes.

Give the mainspring about half a wind, then take the sharpened matchstick and very slowly push the lever across the normal working arc.

Directly the pallet pin leaves the locking face, the lever horns will leave the matchstick and should snap across to its opposite extremity. But, if the lever snaps away from the matchstick, and then jumps straight back again, this shows that the engaging pallet pin has missed the locking face, and instead, received immediate impulse.

This must be cured, and provision is usually made to do this easily.

The lower lever bearing will be found to have a horse-shoe slot cut round it (see Fig. 7). Insert the screwdriver and force this projection towards the escape wheel. Very little movement is necessary here otherwise the escape teeth will not be able to clear the pallet pins.

When the bearing has been forced over enough and the lever snaps back and forth as it should do, try the action for every tooth of the escape wheel. Sometimes it is found that one tooth is causing all the trouble, or the wheel is not quite round.

In this case the treatment outlined above will sometimes suffice, but if badly out of round a new escape wheel will be needed.

Should this be necessary, the "M.E." advertisers can help you, and usually these spare parts will be found quite inexpensive.

However, assuming that the treatment is effective, the next step is to replace the balance wheel. Make sure the wheel is lowered in with the impulse pin on the correct side of the lever horns.

When the wheel is in and the balance cock screwed down, lead the balance wheel round with a matchstick, and with the tweezers try the "shake" of the lever on that particular side. Let the wheel swing round and try the other side. They should be equal, but if they are not it means that the lever is not straight and this must be remedied by taking the lever out again and straightening the arm. Do not try to straighten it while still in the watch, because in this way it is very easy to break the pivots if you do.

Having done this, you will have the pleasure of seeing the balance swing merrily, and know that you have effected the most common repair to a pin-pallet watch.

Finally, the watch will need cleaning.

Club Headquarters

Prospects and Possibilities

THE S.M.E.E. has now acquired new club headquarters. That being so, it is thought that an account, both of the difficulties involved in the search for them—a search that has extended over six years—and of the amenities that they will provide, may be welcome to readers.

From time to time, in THE MODEL ENGINEER and at club meetings, prophets—or visionaries, according to your individual point of view—have set out their hopes and ideas for a model engineering headquarters in London. Naturally, and rightly, the writers, wishing to express their ideal, included everything. The specification usually calls for a clubhouse, with workshops, library, demonstration and meeting rooms, and sometimes a restaurant and sleeping accommodation thrown in, standing in extensive grounds, containing boat pools and permanent locomotive and race car tracks, and the whole within five minutes from Piccadilly Circus. When a writer is, upon his own confession, building castles in the air, it is not fair to criticise him for the lack of solid foundation. And it is also fair to say that a man, or a club, or a movement, which has no aims beyond what is immediately possible, will never get very far. It is a very good thing to have a star to steer by.

The Financial Facts of Life

Nevertheless, the innocent and hopeful club member is often apt to think that some part at least of the programme should be immediately practicable and from time to time, the unfortunate club officials have to explain to a rather sceptical meeting what may be termed the financial facts of life. It is, in fact, very unfortunate that the great post-war wave of interest in model engineering should have coincided with the even greater wave of demand for London premises, premises of almost any sort. Moreover, the blitz, and particularly the fire bomb blitz, was harder on the older and smaller premises more suited both in size and cost, to club use. In fact, the commercial rental of business premises in London is now such as automatically to bring them entirely out of the scale of practicability for model engineering clubs.

How far this state of matters will continue is, of course, something on which no sensible person would commit himself, but it can, I think, be said that for some years to come, no club, unless its members are millionaires, will be able to go out and buy or rent suitable headquarters in the open market.

Faced with this prospect, more than one club has considered the possibility of obtaining one of the old large houses, which are now comparatively unpopular, converting part of this into flats, and letting them, and using the remainder for headquarters. This is not an impossible idea, and, in fact, the S.M.E.E. went into a proposition of this nature very carefully about two years ago.. It did appear, at that time, that a financial scheme could, on paper, be prepared which would provide headquarters premises at a cost within the means of the society. But this scheme was dependent on two things. First, it was necessary to assume that the income which could be expected from the flats at that time—a time of scarcity—would remain constant for the next 30 years. Secondly, the scheme rested on the assumption that a very substantial loan could be obtained at a comparatively low rate of interest. While this last difficulty was not thought insuperable then, though since that time rates of interest have increased greatly, it was felt that no responsible committee could take on obligations of this scale relying, or rather gambling, on flat rents staying at their present figure. That is not to say that a practicable scheme on these lines cannot be evolved on the facts of an individual case, though the writer knows of no such lucky circumstance. It does, however, mean that any such transaction will involve the acceptance of a considerable risk, and the raising of considerable money for conversion, and it is doubtful whether the ordinary model engineering society is fitted, in make up, to act as a landlord and manager of property.

A Confession of Defeat?

This might be thought to amount to a confession of defeat. This is far from the purpose of this article. In fact, there is a possibility which has not been dealt with and is, in fact, usually overlooked. There are always in existence a certain number of premises which are not suitable for the ordinary market, premises which are unfitted for ordinary commercial or residential purposes. Sometimes they are rural buildings, stables, or the like, which have been swamped by the town. Sometimes they are chapels, or halls, of sects that have disappeared. They are rare—make no mistake about that—and, just because they are not saleable, they are seldom advertised. But by patient research, such premises can be found, and they may be very suitable for club purposes.

The premises which the S.M.E.E. have now taken over and are adapting, are of this nature. This is the outcome of a patient and steady search on the part of the council of the society, which has been going on continually since 1943. In the course of that search, premises of every sort have been considered, from a disused laundry to a Regency town house, and from a rackets court to a dress factory. The premises are not ideal, either in situation or size, but they do offer facilities which, till now, have not been available, they do represent a great improvement on existing facilities, and above all, they do constitute a substantial step on the long and difficult road towards the ideal.

The new club premises are a disused Coroner's Court in Brixton, near Loughborough Junction. They are, of course, on the map far from central, but measured by time, they are quickly accessible to all parts of London, being within two minutes

of Loughborough Junction station, where several tram and bus routes stop, and five minutes by tram from Stockwell station on the Northern tube. If and when the new South London tube line is constructed, the premises will be on their doorstep. So, from the point of view of access, the premises are, to say the least, not inconvenient.

As regards the nature of the premises, they form the lower half of a rather dignified house in a *cul-de-sac*. The other side of the road is the B.R. Southern Region, but so far, no negotiations for running powers have been opened. The upper part of the house is a self-contained flat, which is also included in the letting, but which, not surprisingly, is already tenanted.

Access to the building is gained by a massive pillared porch giving upon a small entrance hall. On the right of this hall is the court room—which still bears the marks of its former use. It is a spacious room—26 ft. × 13 ft., and at its far end, its wood-blocked floor is raised to form a dais, and to accommodate the coroner's seat of office, while along one wall there remains the row of seats for the coroner's jury. It will be appreciated that this makes an ideal chamber for council meetings and committee meetings, and for small society functions, though, as no more than 60 people could conveniently be accommodated, it is rather too small for general meetings. At the rear of the court room is a smaller room, 13 ft. square, which is intended for use as the library, and for display of some of the society's models. It is not, however, proposed that this should be the conversation room of the club, but rather a room for research and study.

On the opposite side of the hall to the court room, is another, rather smaller room, some 16 ft. square. At the rear of this room is a passage from which a stairway runs to the basement, where the workshop will be situated. This room is intended as the general club room, reading and conversation room. It is expected that in practice the court room and library will not be used much by the ordinary workshop visitor, and, as they constitute in fact, a separate unit, every effort will be made to fit up the clubroom with what the model engineer regularly needs. The room will be supplied with reference books, including sets of THE MODEL ENGINEER, current numbers of the model press, scrap paper for the inevitable sketches, and, above all, ash-trays. As it is hoped to provide facilities for "brewing-up," there is some justification for expecting that members, even members not desirous of using the workshop, will develop the habit of "dropping in" occasionally.

Descending the stairs to the basement, the visitor will come to the "business end" of the premises. Though, technically, a basement, the floor is, in fact, only about two feet below ground level, and in consequence, the place is well supplied with natural light. Its only defect, from the workshop point of view, is a rather low ceiling. A long room, running from the rear of the premises under the library and part of the court room, will be the main machine shop. Here, the large lathes, planer, millers and shaper will be installed. Adjoining this is a small room fitted with a sink in which the forge, brazing and oxy-acetylene can be found. A room situated under the hall and porch will be used as a store cupboard, and the two remaining basement rooms, one under the club room and one under the court room, are intended for a fitting and light machine room, and for the installation of the society's test gear and boiler.

This is the plan—not a castle in the air, but an actual and positive plan—which will be completed and in operation before six months are gone. But to bring it about involves both work and expense. The premises, as they stand at present, suffer from 13 years of disuse, and in the basement, from conversion into air raid shelters. A considerable amount of work is being done professionally, but most of the work will be done by members. Many have already volunteered, but all are welcome. There is work for all, and it is work which will give an immediate prospect of results.

Compared with the ideals and fond visions that have been expressed in the past, this project may seem modest. But it does provide a London headquarters, a place where model engineers can foregather to work or to chat, and it may well be that, in 50 years' time, we may look to this as the foundation stone of a great achievement.

News from Barnstaple

At the annual general meeting of the North Devon Society of Model Engineers, held early in January, the members reviewed a satisfactory record for the past twelve months. The biggest event was the erection of a $3\frac{1}{2}$-in. gauge track, 250 yards long, in the football field at Pottington, Barnstaple, permission for which had been granted by the Barnstaple Town Council. A civic opening took place at Whitsun, and during the season about three thousand passengers had been given rides on the track. Part of the proceeds have been sent to the Mayor's Benevolent Fund. It is intended to have an annual opening ceremony in the late spring or early summer and to operate the track throughout the good weather. The president, Mr. A. M. Carpenter, showed some films in technicolor, depicting work starting on the track in February and marking progress up to the opening at Whitsun. There were also some scenes on the society's "OO"-gauge layout and on Mr. Carpenter's Gauge "1" garden railway.

The society would welcome some new members; anyone interested should apply to the hon. secretary, Mr. J. E. P. Hutchinson, 8, Clinton Terrace, Barnstaple. We do not often hear from this western outpost of our hobby, and at the beginning of this, its third year, we wish it all possible success and a substantial addition to the already satisfactory bank balance.

Novices' Corner

A Tailstock Tap-holder

WHEN tapping in the lathe, by means of a tap guided by the tailstock chuck, the tap can be turned with the aid of a lathe carrier, or similar fitting, clamped to the tap shank, as previously stated. A small holder that has been found useful for this purpose is illustrated in Fig. 1, and the working drawings to assist in making the tool are given in Fig. 2.

The body (*A*) of the appliance can be made from a hexagon nut some $\frac{3}{8}$ in. in thickness, or, if preferred, this part can be machined from a length of hexagon steel rod measuring $\frac{5}{8}$ in. or more across the flats. Although there is no reason why a piece of round material should not be used for the purpose, the flats on the hexagon material facilitate both the marking-out and drilling operations required when fitting the clamp-screw and the lever arms.

If a nut is used, it is gripped in the self-centring chuck, and a drill mounted in the tailstock drill chuck is employed to clean up the bore and remove the threads ; a drill a size larger than the nominal bore of the nut will be found suitable.

From the Solid

Where the body is made from the solid, the material is gripped in the chuck and a centre drill, held in the tailstock chuck, is fed in to make a guide centre for the drill of $\frac{1}{4}$ in. diameter, or so, which follows. If it is found, as happens when drilling in some lathes, that excessive pressure is required to turn the tailstock feed wheel, then a pilot drill of say, $\frac{1}{8}$-in. diameter should first be entered to the full depth of the hole ; this will allow the larger drill to cut freely and with very little tailstock pressure. Next, the edge of the body is chamfered with a tool having a cutting edge inclined at an angle of about 45 deg., and a finishing cut is taken across the face of the work to remove any burrs set up by the drilling operation.

The body can now be parted off to the required length, preferably by employing a parting-tool mounted upside-down in a back toolpost. The tool must be fed in slowly and evenly, especially when cutting through the corners of hexagon material, and at the same time, a continuous supply of cutting oil should be fed to the tool by means of a brush held against the work. When using the parting-tool, any tendency for it to dig in and jam in the work will be reduced if the backlash in the feed-screw of the slide is taken up and if, in addition, the slide is adjusted to work rather stiffly. Should chatter be experienced, the lathe speed must be reduced ; but if the lathe is sufficiently rigid and the mandrel bearings are in good order, parting-off can be carried out at ordinary turning speeds.

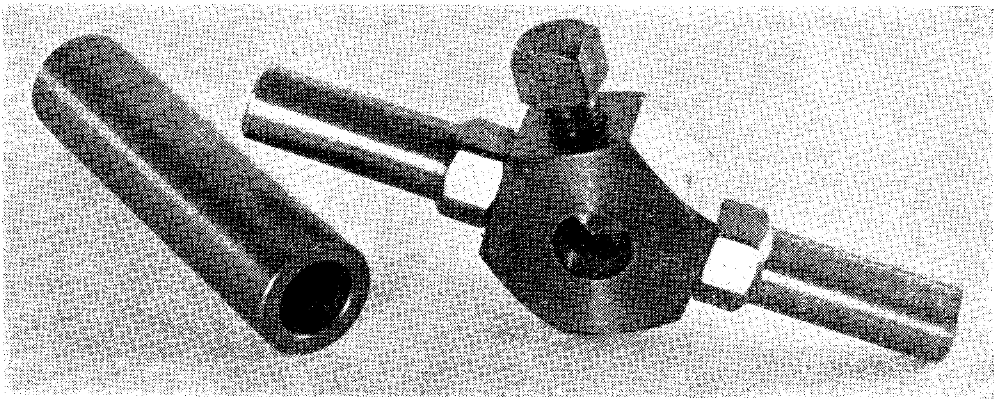


Fig. 1. The tap-holder with the extension handle

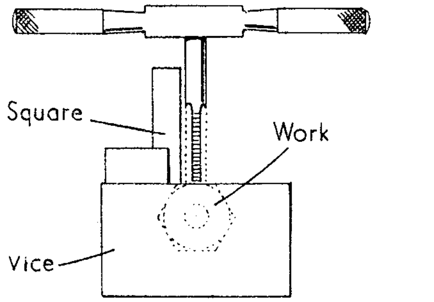
Drilling the Holes

After the body has been parted off, it is reversed in the chuck for facing and chamfering the back surface. To drill the holes to receive the handles (*B*), the body is gripped in the machine vice between pieces of thin card to prevent the vice jaws damaging the machined surfaces. One of the flat faces of the hexagon is set horizontally by allowing the opposite face to bed against a piece of brass strip resting on the work face of the vice. The centre of the face is marked-out by scribing diagonal lines joining its opposite corners, and the point of intersection is then marked with a centre-punch, using only very light hammer blows to avoid damaging the vice ; it is, however, both kinder to the vice and more workmanlike to transfer the part to an iron block for centre-punching. The punched centre is enlarged with a small centre drill to form a

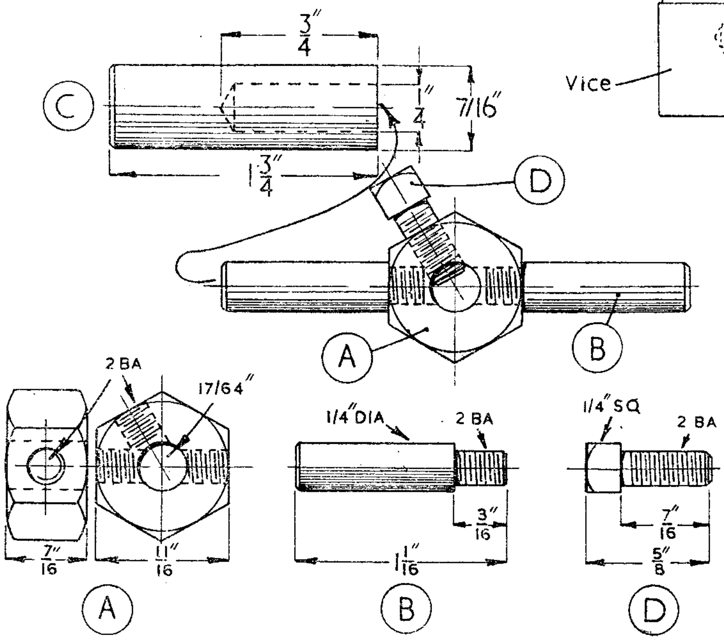
guide centre for the No. 24 drill which follows to form the No. 2-B.A. tapping size hole. This drill is put right through the body, and the packing strip is intended to protect the vice face from damage. To avoid burrs being thrown up by the tap, the mouth of the hole is enlarged with a $\frac{3}{16}$-in. diameter drill to a depth of 1/32 in.; the work is then reversed in the vice to enable the other end of the tapping hole to be counter-drilled in a similar manner. The hole to receive the clamp-screw (*C*) is drilled similarly and to the same size. These holes are all tapped 2-B.A., and if this operation is carried out in the drilling machine as previously described, there will be no difficulty in forming the threads truly.

Should it be decided, however, to tap the holes by hand, then the body is set in the machine vice, as when drilling, and the tap is maintained at right-angles to the face of the work by applying a small square to the vice jaws, as illustrated in Fig. 3. The flats on the body are then given a good finish by filing with a fine file and, to complete this part, it is slowly heated until a blue tint forms, and the final deep blue colour is given by quenching in oil.

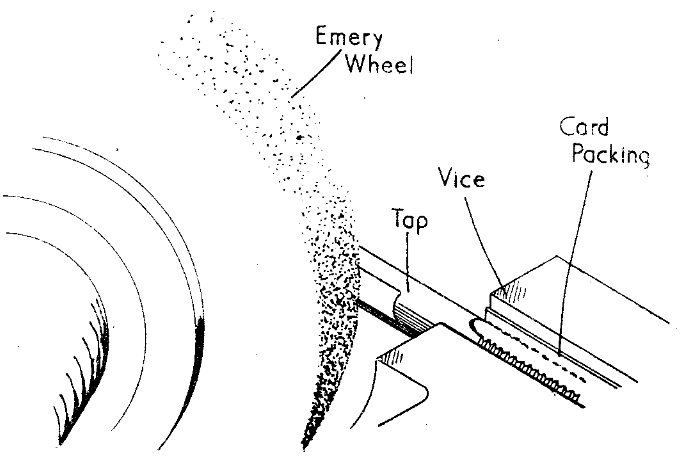
The two handles or lever arms (*B*) shown in the photograph were machined from No. 4-B.A. nut-size hexagon rod, but round material, as illustrated in the drawings, will serve equally well if it is finally screwed firmly home in the body. The machining of the handles is a straightforward turning operation, followed by threading the ends with the aid of the tailstock dieholder; but care should be taken to turn the parts parallel and to the exact diameter shown, so that they will fit into the extension handle (*C*). This handle is for the purpose of providing greater



Above—Fig. 3. Checking the squareness of the tap with the work



Left—Fig. 2. Dimensioned details of the tail-stock tap-holder



Below—Fig. 4. Showing method of grinding a flat on the tap shank

leverage when using the larger-size taps, or it may be lodged against the lathe top-slide to prevent the tap turning when the tapping operation is carried out by rotating the lathe mandrel and keeping the tap stationary. If the latter method of tapping is adopted, care must be taken to avoid submitting the tap to side-strain, which might cause breakage. The handle extension-piece is made from a length of steel or brass rod, turned on its outer surface and axially drilled for reaming to the finished bore size of ¼ in.

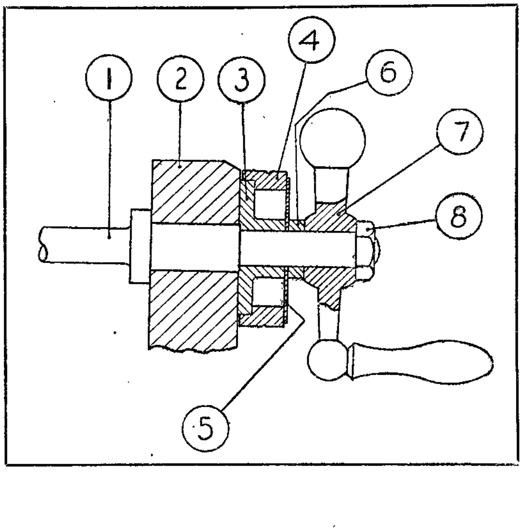
It now remains to make and fit the clamp-screw (*D*). This part is made from hexagon, square, or round rod ; but if round rod is used, the head will have to be filed square or to hexagon form when finishing the screw. It will be noticed that the tip of the screw is shown deeply chamfered ; this is necessary, as the clamping pressure will tend to burr the end of the screw and so cause it to bind in its threaded hole.

When using a tap holder of this pattern, it can readily be turned backwards and forwards, as the short handles fitted will not foul the adjacent parts of the lathe. Needless to say, the end of the clamp-screw cannot obtain a positive grip on the round shank of the tap, but this hold should be found quite sufficient for operating small taps. Where a more secure grip is needed, as when taps of larger size are used, a small flat to engage the tip of the clamp-screw can be ground on the tap shank in the manner illustrated in Fig. 4. For this operation, the tap is gripped between pieces of thin card in the machine vice, and the tap shank is then moved for a short distance to and fro across the edge of the grinding wheel.

A Friction Index Collar

HAVING found that the index rings on a certain high-class American lathe were far short of what was desired, I fitted index-rings of the design shown here. These collars have now been in use for several years, and have required no adjustment since the original fitting.

I give no dimensions, since details will vary from lathe to lathe. Briefly, then, the bearing end of the feed-screw (1) is shouldered down to leave a portion about 0.001 in. longer than the bearing-plate (2). A shouldered collar (3), is fitted to the feed-screw, and the index ring (4), is a rotating fit on the outer diameter of this collar. The depth of the recess in the ring should be 0.005 in. to 0.010 in. less than the thickness of the collar rim, and the two parts should assemble up so that the smaller end of the collar is about 0.005 in. below the end of the index ring.



A disc of 0.020 in. spring steel (5) is next threaded on to the spindle, followed by the spacer (6), the ball handle (7), and the whole assembly then clamped up solid by the nut (8).

The degree of friction grip may be increased by reducing the length of the small end of the collar (3) or reduced by facing off a little from the end of the index ring.

On final assembly, the annular space between the collar, ring, and spring, should be filled with a light grease.

It will be found that it is almost impossible to shift the ring accidentally, and there is none of that annoying odd "half-thou." of slack which is often found—the index working smoothly at all times.

When, after lots of use, the index finally begins to work loose, its original "feel" can be restored by simply facing off the end of the collar, as for increasing the friction.—W. S. LAYCOCK.

[We are always in need of short articles of this kind. They should deal briefly with any subject, from novices to experts standard.—ED.]

"PAMELA" by "L.B.S.C."

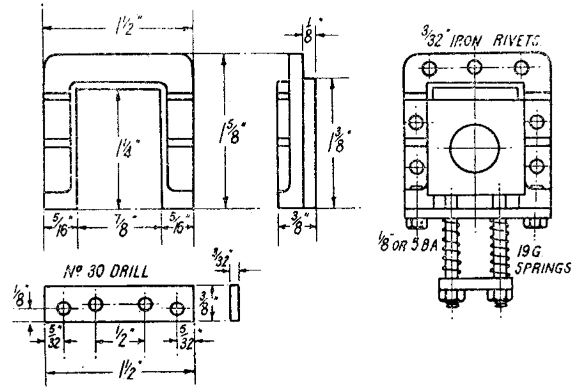
A $3\frac{1}{2}$-in. Gauge Rebuild of a Southern Pacific

THE hornblocks were mentioned in the opening instalment of this serial, as being of the same kind as used for *Doris*; and to obviate new readers having to search through back numbers, a drawing of them is shown here. This type is small and neat, yet amply strong enough for use with $\frac{1}{8}$-in. plate frames; but at the same time, if any builder has any other type of $3\frac{1}{2}$-in. gauge hornblock he wishes to use up on the job, there are no objections. The only important point is, that the axleboxes must be so arranged, that the centres of the axles are $\frac{5}{8}$ in. from the bottom of the frame when in running position; that is, with the engine standing on the rails boiler about three parts full, and a good fire in the box. Full details of the machining and fitting of the hornblocks were given with the *Doris* notes, and again full, dealt with in the instructions for building *Tich*.

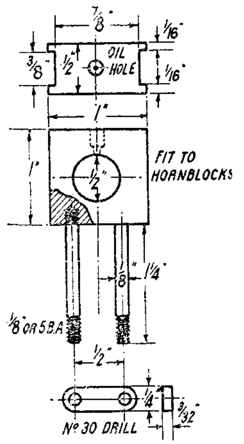
The axleboxes are 1 in. square blocks of bronze or gunmetal, $\frac{1}{2}$ in. thick. Our approved advertisers usually supply the whole six cast in one stick; and the machining and fitting operations are exactly the same as described for *Tich*.

The fit of the boxes in the horns, should be exact in a fore and aft direction, quite free to follow the irregularities of a rough road, but not easy enough to knock under the alternate pull-and-thrust of the connecting-rods. They should not be too tight at the flanges, because a slight amount of freedom here, is an advantage. When a wheel strikes a low rail joint or a crossing frog, or some other small depression in the line, and drops a little, the axlebox should be able to tilt sufficiently to allow for the slight temporary angularity of the axle. This prevents that bugbear of old-time enginemen, hot boxes. There used to be an old driver at one of the L.B. & S.C.R. depots who was known as "Dog's-nose," because very often, when running, he would lean over the side of the cab and sniff like a bloodhound picking up the trail. We always reckoned he could smell a hot box before it got hot (says Pat) and indeed, it seemed to be so!

Whilst on the subject of axlebox freedom, don't forget the wheezes I have given with regard to fitting axleboxes, viz. mark each box so that it can always be replaced in the hornblock to which it was originally fitted; and after fitting, put the hornstays on, jam the axleboxes up against them, and make countersinks on the bottom, with a No. 30 drill poked through the holes in the hornstay, as a guide for drilling and tapping the holes for the spring pins. Reminder also for beginners: mark out and drill one hornstay and one spring plate, and use them as a jig for drilling the remaining five; $\frac{1}{8}$-in. silver-steel is the best stuff to use for the spring pins, plus ordinary commercial nuts. The complete assembly is shown in the drawing, and needs no further explanation. Don't forget to put a bit of $\frac{1}{8}$-in. square rod, or any bit of metal $\frac{1}{8}$ in thick, between each hornstay and axlebox, tightening the springs to hold it there; this retains the box in running position whilst fitting up the cylinders and motion, the pieces being removed before the engine takes the road.



Hornblock and stay



Main axlebox

Coupled Wheels and Axles

The full-size "spam cans" have "B.F.B." coupled wheel centres, which are very similar in appearance to the American "Boxpok" (which being interpreted means "box-spoke") and other perforated disc-type wheels. It is quite possible that our approved advertisers

may reproduce these special wheels in the size required; but if they don't, ordinary spoked wheels will do quite as well. In fact, I would prefer them, personally. Anyway, whatever type of casting that builders obtain, the machining and fitting of them, will be precisely the same as described for all the other engines in this series, and fully detailed for *Tich*. The balance weights are not apparent on the "fancy" wheels, and may be left out altogether on the little engine, as the working parts are not sufficiently heavy to cause bad vibration; but where spoked wheels are used, it would be better to put them in as shown in the illustration.

The axles may be turned from ½-in. round steel rod. Ordinary drawn or rolled mild-steel will do quite well; ground stock, or silver-steel, makes a more posh job, though a little harder to turn, when forming the wheel seats. If your three-jaw chuck is as virtuous as history—official this time!—tells us was the case with a certain Italian lady named Mrs. Caesar, all that is needed is to grip the axles in it, and go right ahead and turn the wheel seats, as described for *Tich*; but if the chuck is "doubtful," and the usual bit of foil or paper under the offending jaw doesn't do the needful, in the cause of veracity, use steel a little larger than ½ in. diameter, and turn the whole axle between centres. I've had many a friendly crack at our departed friend Bro. "Iron-wire" Alexander, for his love of centre turning; but considering the kind of lathe commonly used in the days when he wrote his locomotive-building instructions, he knew what he was talking about. His engines were ungainly, crude things, but they certainly worked all right, did all he claimed for them, and used very little steam, which was more than could be said for many more "advanced" and "well-thought-out" designs that appeared long after.

The crankpins should be turned from silver-steel, leaving the working surfaces in the polished "natural" state, which resists wear to a phenomenal degree. If the chuck won't hold the rod truly, a split bush could be used, such as I have repeatedly described for holding piston-rods when finish-turning the pistons, as the rod from which the pins are made, is only small stuff and easily held. The retaining washers for the leading pins can be parted off an odd bit left over from the axle job. The 7/32-in. spigots should be a tight press-fit in the holes in the wheel bosses, especially the driving pin, which carries the return-crank for the valve-gear, and therefore must not turn; but don't overdo it and split the wheel bosses when pressing home. Turn the extreme end, say about $\frac{1}{16}$ in. length, a tight push-fit in the hole; then, if you turn the rest just a thousandth of an inch bigger (measured either by "mike" or by the graduations on the collar of the cross-slide screw) there will be "plentee muchee squeezee and no bustee" as Chu-Chin-Chow would remark. Incidentally, the engineer of a tramp steamer told me in a letter, that he was reading a copy of this journal in a Chinese eating-house in a remote corner of the world, when the proprietor spotted it, and cheerfully volunteered the information that he was building a "Dlyak." He was, too, and making a jolly good job of it, at that!

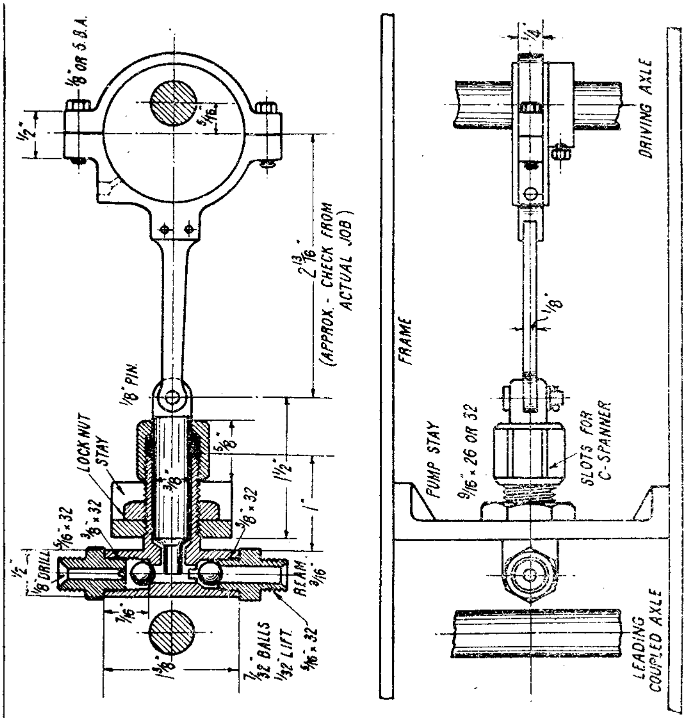
Coupling-rods

The only difference between the coupling-rods for *Pamela* and those for *Doris*, is the length between the centres of the bosses; so if you look up the instructions for the last-named lady, there will be no need for your humble servant to go through the whole ritual again. Beginners can follow the notes on the rods for *Tich*, as far as the two sections of the rod are concerned; they can slot the shorter rod for the tongue of the knuckle-joint, by the method given for slotting the pump-ram, and form the tongue itself by pin-drilling each side of the end of the longer rod, until it will just enter the slot. The pin can be turned from a bit of ¼-in. round steel; any kind will do, as the movement is so small. Beginners should also bear in mind, that whilst the driving bush must be reamed, and a close working fit on the ⅜-in. crankpin, the leading and trailing bushes must be easy, but not slack or "sloppy," on their respective pins. If they are too tight, the bushes will bind on the pins when the axleboxes are following the variations of a badly-laid or uneven road, or running through crossing frogs. Full-size engines are given $\frac{1}{16}$ in. clearance when new, and their tracks are far better laid and maintained than the average club or back-garden line. This accounts for the ringing and clanking when coasting, the cause of which is often asked about in beginners' and new readers' letters.

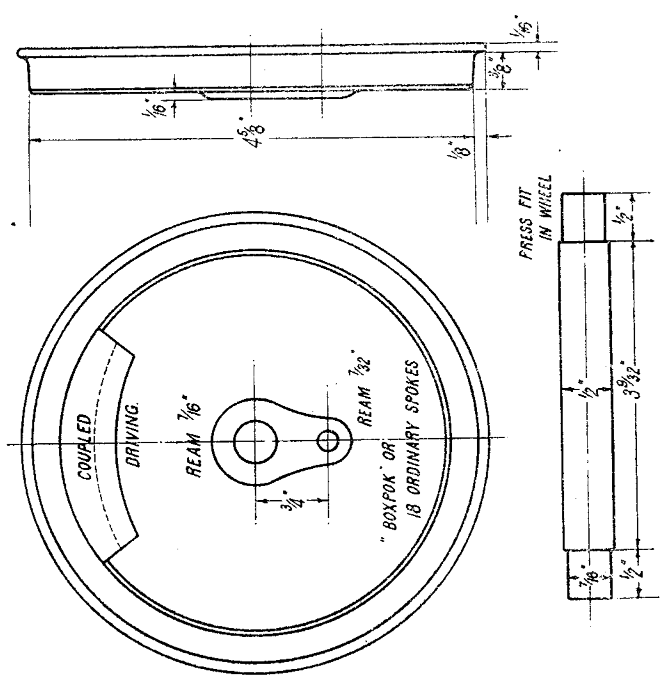
Pump and Eccentrics

The feed-pump and the two eccentrics (one for pump, and one for mechanical lubricator) should be made and fitted before the coupled wheels are pressed on "for keeps." The eccentrics can be turned from a stub end of 1½-in. round steel shafting, which is easy to machine, and stands the wear. The *modus operandi* is as described for *Tich*; turn the groove—recollect my advice on parting-tools—face the end, and part off enough to include the boss. Mark off the position of the axle hole, centre-pop same, chuck in four-jaw with pop-mark running truly, drill and ream for axle, then mount on a stub mandrel to turn the boss. The larger eccentric goes on the driving axle, and the smaller one on the leading axle.

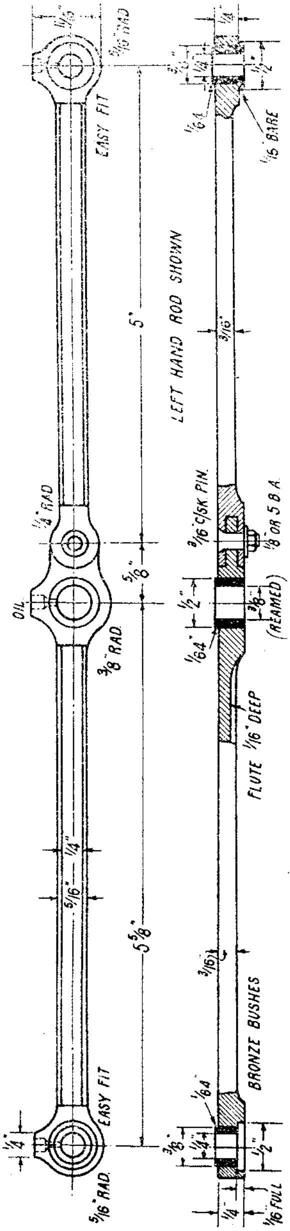
If I were building *Pamela* for my own use, I wouldn't bother about a pump at all. Our engines of Stroudley design on the "Brighton" all had pumps, the tank engines bypassing the water back to the tanks when there was sufficient in the boiler, which is where I got my idea for the bypass stunt, universal with my pumps. But the reason for the pumps was, that part of the exhaust steam went back into the tanks and tenders, and the water became too hot to be fed in by an injector. On Bob Billinton's engines, the feed was cold, and they all had injectors. Modern engines kind of "short-circuit" the Stroudley idea; instead of heating the water with part of the exhaust steam, and then pumping the hot feed into the boiler, they use an exhaust-injector which utilises part of the exhaust steam to put the water straight into the boiler without bothering about any pump at all; and the steam heats it up in the process. The only reason I don't follow suit on my little



Above—Boiler feed pump



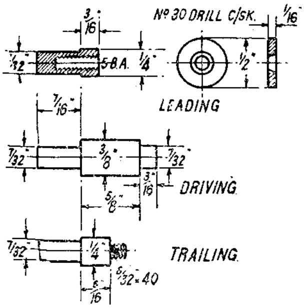
Coupled wheel and axle



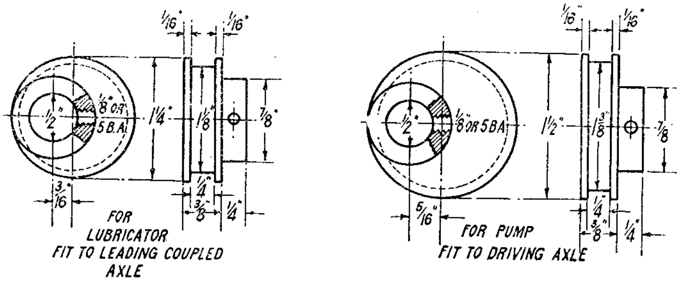
Left—Coupling-rods

engines—I can make the exhaust injectors all right—is because our little girls, with their bronze cylinders, need ever so much more oil, in proportion, to that used by their big sisters. Consequently, the exhaust steam is very oily, and up to the present I haven't been able to fix up any device to get rid of this oil, which must not be allowed to enter the boiler, otherwise there would be trouble through bad steaming and excessive priming. I have tried weeny replicas of full-size oil separators, but they become choked after a few minutes' running. Therefore, I use live-steam injectors; and although most of my engines have pumps, I seldom use them myself, operating the injectors, same as I would on a full-size modern locomotive, except in the case of old *Grosvenor*. She has a weeny crosshead pump, same as her big sister had, and I use it just for the sake of sentimentality. Though of "scale" size—the ram is only 1/8 in. diameter—it will push the water up out of sight in the top nut if left on too long, which is silent testimony to the small amount of steam needed to work the engine. I know of a 4-6-0 (in fact, several 3½-in. gaugers) which takes the full output of a ½ in. bore pump to maintain the level with the same load; they wouldn't use any more than *Grosvenor* if the cylinders and valve-gear were as they should be.

There is, however, one great advantage about a pump, and that is, that if somebody else is driving your engine, you can leave the pump working, and rest assured that the relief driver won't "drop the lead plug," as full-size enginemen call it, even if he loses all the steam through not attending to the fire. Also, many readers still fight shy of injector-making; why it should be so, goodness alone know, because the job is straightforward enough if my detailed instructions are followed. No moving parts, very little piping—what more could anybody wish? However, there it is; and as your humble servant always tries to please the majority, a pump is herewith illustrated for *Pamela*. It is practically the same as specified for *Doris*, but the eccentric-rod is a little longer, owing to the different wheel spacing. The location of the pump stay was given in the plan of half the frame, and also an elevation of the stay itself. Fancy designs for pumps come and go, but these "old reliables" do the job, and keep on doing it; only very seldom do they need removing during the lifetime of the engine, as there is nothing to go wrong. If the valve-balls become tight on their seatings, after a long period of idleness, all you have to do, is to give the valve-box a tap, and the pump immediately resumes business. If the pump-ram is an easy, sliding fit in the barrel, there is no strain on the gland nut, and the gland doesn't leak. Leakage, when apparent, is usually caused by bad workmanship, for which there is no excuse. If the gland nut, for example, is made as I always specify, viz., drilled, counter-bored, and tapped at the same setting, the hole will be true with the threads; and if the barrel is drilled, the outside turned, and screwed with a die in the tailstock die-holder (which of necessity guides the die truly) the holes in barrel and gland will be in line, which is all we need.



Above—Crankpins



Right—Eccentrics

Castings are available for the pump and gland. The instructions given for *Tich's* little pump should be followed by beginners, working to the sizes given in the accompanying illustration; briefly, chuck the valve-box by one end, and set the other to run truly. Then face, centre, drill right through, open out, D-bit and tap, same as *Tich*. Reverse and re-chuck on a screwed spigot held in three-jaw, and repeat operations on the other end, less the D-bitting. Chuck by the chucking-piece opposite the barrel; face and drill barrel, turn and screw outside, cut off chucking-piece, fit balls and union caps. Turn up the gland from a casting, or piece of ¾-in. bronze rod; make the ram from 3/8-in. round rustless steel or hard phosphor-bronze.

Take out the pump-stay, screw the barrel into it, fit lock-nut, put in the ram, and pack the gland; then replace the stay as shown. The eccentric-strap and rod are made, assembled and erected same as described for *Tich*. Don't forget how to obtain correct length of eccentric-rod by pushing the ram right home, dropping the eye of the rod in the slot, scribing a circle on the rod through the hole in the ram, and drilling the pinhole 1/32 in. nearer the strap,

than indicated by the centre of the circle. The eye may be bronze-bushed or case-hardened, as desired. Turn the pin from $\frac{1}{4}$-in. silver-steel, as shown, and secure with a washer and weeny split pin ; or else use a bit of $\frac{1}{8}$-in. round silver-steel, reduced at both ends to 3/32 in., screwed, and fitted with brass nuts.

After fitting the pump to the frame, put the wheels on, setting the cranks at right-angles by the method fully described for *Tich* ; then put on the coupling-rods. The wheels should turn easily by hand, without any trace of binding, or any tight places. If there should be a tight spot, it is usually a sign of the cranks not being all set at the same angle. It might also be that the throw of one or more of the crankpins, is too great, or not enough ; but this contingency cannot arise if the crankpin holes have been drilled by jig, as described for *Tich*. It is a good wheeze to make a dummy pair of coupling-rods, using a bit of $\frac{1}{2}$-in. by about 3/32-in. strip, and drilling the crankpin holes in it at $5\frac{3}{8}$ in. centres. Press one wheel on each axle, and put the lot in place. Set the driving crankpins at 90 deg. with square and scribing block, and press home. Put on the other wheels " by eye " but don't press home ; put on the dummy coupling-rods, adjusting the loose wheels to allow the crankpins to enter the holes in the dummy coupling-rods. When the wheels turn freely with the dummy rods in place, the setting is correct ; the wheels can then be pressed home, and the proper rods put on.

I hope readers won't complain that I am unduly " rushing " the description of this engine, but I am trying to get all the drawings out, so that the good folk who want to get her on the road for the summer running, will be able to do so ; and there is no need for repetition detailing, when I have so recently described *Doris* which she so closely resembles in the working parts. Components which differ from *Doris*, such as bogie, pony truck, and boiler, I shall detail more fully. Next stage, bogie and pony truck.

A Link with George Stephenson

MR. GEORGE M. STEPHENSON, the great, great grandson of *the* George Stephenson, presented an autographed engraving of his famous ancestor to a scout patrol recently.

By chance he heard that scouts at Meopham, near Gravesend, Kent, had named their patrol after the great engineer. The picture shows George Stephenson, with the *Rocket* puffing along in the background. In the photograph George junior is handing it over to S.P/L. J. Byford.

The "Target" Milling Attachment

We have recently been afforded the opportunity to inspect the new "Target milling attachment for lathes. Of robust design and construction, it is easily fixed to the lathe, with the driving end held in the self-centring chuck and the outboard end clamped, by a split bush arrangement, to the tailstock barrel. The milling spindle is offset from the centre-line of the lathe and is driven by two spur gears.

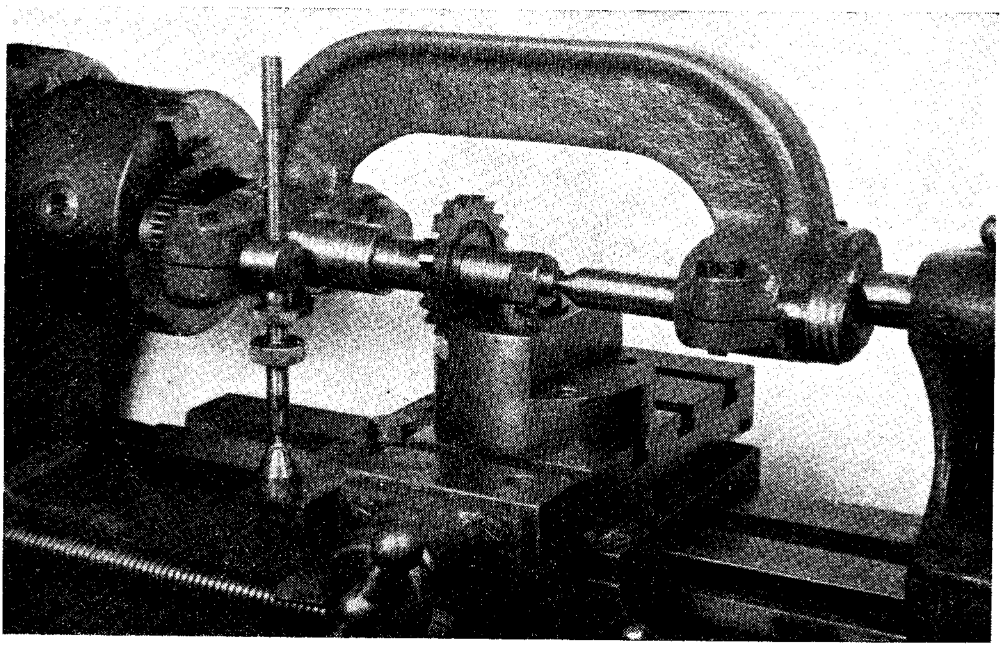
The work is held in any suitable device, i.e. vee-block, clamp or even the toolpost, suitably located to the cross-slide table of the lathe. By swinging the attachment about its locational centres, the cutter can be moved to the exact position required. It is then locked by tightening a single nut.

Thrust is taken by a thrust-rod with a flat, ball-jointed foot which is designed to rest on the bed of the lathe. Where, however, the bed is too narrow for this, a suitable strip may be attached crosswise, as can be seen in the illustration of the attachment fitted to the Myford M.L.4 lathe in the "M.E." workshop. The screw adjustment on the rod gives a fine movement when setting-up.

The general specification is as follows:—Total length $11\frac{1}{2}$ in.; weight, $8\frac{1}{4}$ lb.; vertical movement of milling spindle, $3\frac{1}{2}$ in. ($1\frac{3}{4}$ in. below centre to $1\frac{3}{4}$ in. above); gear ratio 35 to 50; bearings, phosphor-bronze; gears, interchangeable, six back gear speeds and six direct drive speeds; diameter of milling spindle, $\frac{1}{2}$ in.

The attachment may be used on any lathe from 2 in. with a tailstock barrel not exceeding $1\frac{3}{4}$ in.

We are confident that, given reasonable care and used with at least normal intelligence, this device will perform all the tasks accredited to it by its makers, Messrs. Target Manufacturing Company, Wollaston, near Wellingborough.



Queries and Replies

Enquiries from readers, either on technical matters connected with model engineering, or referring to supplies or trade services, are dealt with in this department. Each letter must be accompanied by stamped, addressed envelope, and addressed: "Queries Dept." THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.

Queries of a practical character, within the scope of this journal, and capable of being dealt with in a brief reply, will be answered free of charge.

More involved technical queries, requiring special investigation or research, will be dealt with according to their general interest to readers, possibly by a short explanatory article in an early issue. In some cases, the letters may be published, inviting the assistance of other readers.

Where the technical information required involves the services of an outside specialist or consultant, a fee may be charged depending upon the time and trouble involved. The amount estimated will be quoted before dealing with the query.

Only one general subject can be dealt with in a single query; but subdivision of its details into not more than five separate questions is permissible. In no case can purely hypothetical queries, such as examination questions, be considered as within the scope of this service.

No. 9752.—Lathe Modifications.
D.G.C. (Stowmarket)

Q.—I recently had a 3-in. Grayson lathe offered to me at a very low figure. I, of course, accepted, and am now about to commence the task of almost rebuilding it. As modifications to a similar lathe were described in THE MODEL ENGINEER in 1944, I am asking for advice, as follows:—

(1) I have no tailstock and the makers cannot supply. Can you give me any suggestions?

(2) I was horrified to find no headstock bearings, although the mandrel is very good, running solid in cast-iron headstock, neither is there any thrust bearing of any kind, and the mandrel has pitted the headstock face and mandrel register. Would it be in order to bore out the headstock with a boring bar, and fit split bushes, say, $\frac{1}{16}$ in. thick? Also, could I fit a ball-thrust or would it be wiser to fit a flanged bush on the thrust end? If you agree to boring out, will the method of adjustment suffice or would you advise the method used by Mr. Turpin described in THE MODEL ENGINEER of April 5th, 1945? This seems rather drastic, but what happens to the front bearings? I propose having the mandrel lightly ground, and shall then know it is quite O.K. The backgear seems in very good order and has hardly been used.

(3) The half nut and traverse was certainly open to criticism, and I should like to fit a new apron as described by "Ned" (17-2-44). Would I be able to obtain castings from advertisers? I should also like to fit rack and pinion traverse. Can this be done, using the new type apron?

(4) The slide rests, of course, require attention and I am proposing to fit a new nut, as described by "Ned" (6-1-44) as I have just the parts from an *ex*-R.A.F. computor. Can I obtain a casting for the bearing plate?

(5) I shall, of course, carefully scrape all surfaces and am fitting Allen screws, also stop-screws, etc. What type of tool rest would you suggest, American or English?

R.—(1) We do not know definitely of anyone who could supply a tailstock for your lathe, and it is quite possible that the simplest thing to do would be to make a pattern and get a casting which could be fitted to the lathe bed and bored in position with a boring bar driven from the headstock and supported in a temporary tail steady mounted on the other end of the bed. We suggest, however, that it might be a good idea to ask the Myford Engineering Co. Ltd., Neville Works, Beeston, Notts, if they have a casting of such a headstock, as we find they are always willing to do their best to oblige in matters like this.

(2) We do not advise attempting to bore out the headstock bearings to take bushes. As a matter of fact, with the cheaper types of lathes, the practice of running the mandrel direct in the cast-iron headstock is preferable to the fitting of bushes, and cast-iron will generally give much better wear than bronze under normal conditions of use. We suggest, however, that the front end of the headstock bearing should be faced accurately with a suitable cutter, and a bakelite or fibre thrust washer fitted behind the collar of the mandrel. A thrust bearing of this type is quite satisfactory for all purposes except heavy drilling. If you propose to scrape or lap the mandrel bearings, it is possible that the diameter of the mandrel may be found too small for refitting, and a possible way out of this difficulty, without renewing the mandrel, is to have it built up by electro-deposition.

(3) The casting for the apron fitted to the 3-in. lathe was made by W. H. Haselgrove who, so far as we know, still retains the pattern. With regard to the rack and pinion traverse, this particular apron is arranged so that the pinion engages with the leadscrew, using it as a rack for traversing, which may be open to criticism.

(4) In the case of the bearing plate, Myford's may again be able to help you.

(5) We favour the English or open-side type of toolpost, which has the advantage of a wider range of adaptability than any other type, and also gives quite satisfactory rigidity when holding tools in any position.

No. 9763.—Miniature Motor Units
R.J.E. (Sale)

Q.—I wish to build a modified form of the Ostler "Mini-auto" to propel a bicycle and would appreciate assistance on two points :—

(1) In an engine of this type, 25 c.c. 2-stroke, is it in order to use a crankshaft of the "split-flywheel" type? This would help me to reduce engine overhang even if I had to use an internal flywheel as well.

(2) Can I use a "butterfly throttle" for idling in an enlarged version of the "Atom Minor" carburettor? Would it be better to use another type?

R.—(1) A crankshaft incorporating internal flywheels is quite suitable for use in a 2-stroke engine, but it is generally necessary to keep the diameter of the flywheels relatively small to avoid excessive crankcase clearance. This would not be a great disadvantage if an external flywheel, as used, is used as well.

(2) The use of a butterfly throttle in a suitable design of carburettor is quite in order. As you are probably aware, some types of motor-cycle carburettors are now fitted with butterfly throttles. The older type of plunger throttle is really a relic of early carburettor development. A compensated jet type of carburettor such as the Atom type R or Mark III would be quite suitable.

No. 9753.—Details for the "Atom V"
G.L.C. (Filton)

Q.—Would you kindly advise me on the following points relating to the "Atom V" 30-c.c. engine?

Are castings and drawings available for a carburettor designed for continuous running?

Details of the pump do not appear on the drawing; are these available?

Are details of the contact-breaker available?

What is the estimated b.h.p.?

What is the maximum r.p.m.?

What types of fuel were envisaged for use with the engine?

Do you recommend the addition of oil in the fuel for continuous running as well as lubrication by the oil pump?

R.—The carburettor recommended for the "Atom V" engine is the Atom type R, castings for which are available from W. H. Haselgrove, 1, Queensway, Petts Wood, Kent. Blueprints of this carburettor can be obtained from our publishing department, price 2s. 6d. net, but it should be noted that the bore dimensions in this drawing are for 15-c.c. engines, though castings of a suitable size for the 30-c.c. engine are available from the above source.

The forced lubrication pump for the "Atom V" is a type which has been designed to suit a number of other engines. Detailed drawings of this pump are given in our handbook *Model Petrol Engines*, price 7s. 6d. net.

The contact-breaker recommended for this engine is also a type which has been used on several other engines and is also described in the book referred to.

Exact details of the brake horse-power and r.p.m. of this engine cannot be furnished, but the performance of the engine can be guaranteed comparable with the best examples of 30-c.c. engines, on which any information is at present available.

The engine will work on "straight" petrol at the designed compression ratio, but cooler running is assured by using an alcohol or benzol blend of fuel.

A small addition of oil to the fuel is advisable in addition to the lubrication supplied by the oil pump, but the amount should not exceed 1 in 20. It is, of course, possible to run the engine entirely on petroil lubrication if it is desired to dispense with the oil pump.

No. 9760.—Bending Duralumin
J.E.B. (Nantwich)

Q.—In a recent article in THE MODEL ENGINEER on "Tube Bending," no mention was made as to the procedure for bending duralumin. Would the same method apply to both? I have been told that duralumin can be bent in hot water.

R.—The methods employed for copper tube bending are generally applicable to duralumin, provided that it is annealed immediately before bending. We have never heard of bending duralumin in hot water, and can find no logical reason for thinking that this would be helpful in any way.

Annealing of duralumin is usually carried out by means of a salt bath, but when this is not available, some indication of the correct temperature can be obtained by marking the material with ordinary soap, and as soon as this becomes carbonised by the heat applied, the material is hot enough. Any further heating would make it brittle. Bending must be carried out within a few minutes of annealing, as the material rehardens within about an hour without any further heat treatment.

No. 9766.—Small Oil Pumps
W.A.G. (Worthing)

Q.—Could you assist me in obtaining a small oil pump for pumping very light oil? I require it to be as small as possible, about 4 in., but capable of pumping oil to a pressure of, say 200 to 500 lb. per sq. in. Could you let me know the makers of small pumps, either of the gear of plunger type?

R.—There are several manufacturers who produce small pumps suitable for your purpose, but we are of the opinion that the simplest solution to your problem would be to obtain one of the aero-engine oil pumps which are at present obtainable very cheaply on the surplus market.

Most of these pumps are of the gear-wheel type, and many of them incorporate actually two pumps of different widths, one being intended for oil feed and the other for scavenge. We think that either one of the pumps could be used and the other removed if necessary, though it would do no harm if it were simply running free.

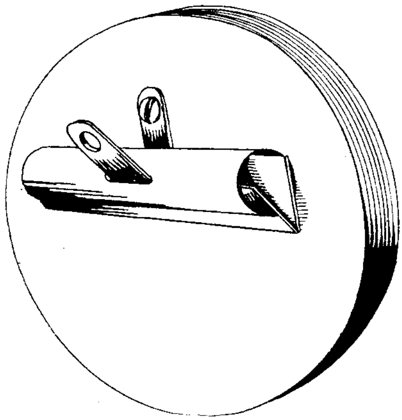
We suggest that you apply to Messrs. Aero Spares Ltd., 69, Church Street, Edgware Road, N.W.1., for a pump of this type.

PRACTICAL LETTERS

A Simple Micrometer Stand

DEAR SIR,—Whilst measuring small parts with a micrometer, I have often felt the need for a suitable stand, or clamp, to hold the tool.

Commercial stands seem to be complex and expensive, and the construction of one calls for suitable facilities and a considerable amount of time. I eventually used the idea shown in the rough sketch, which seems to overcome most of the problems. The base is a circular piece of 9-ply wood about ½ in. thick and 5 in. diam., with a piece of white cartridge paper pasted or glued to it, to form a light background. A "Bulldog" paper clip is fixed in position with a suitable washer and round-headed woodscrew, and the job is complete.



Although this is so simple, I have found it very useful for holding a variety of things, such as magnifying glass, depth gauge, soldering clamp, etc., and it is rapidly fixed and released without screws or adjustments.

The idea might be of use to other readers of THE MODEL ENGINEER, who could, of course, modify details to suit their own particular requirements.

Yours faithfully,

Epsom. C. C. ROSE.

Traction-Type Tram Engines

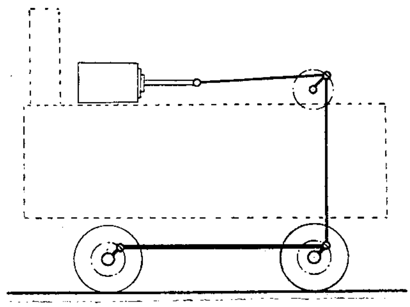
DEAR SIR,—I was interested to note from the issue of THE MODEL ENGINEER, dated November 17th, 1949, that Mr. Warren Hallum, U.S.A. had been in touch with you *re* traction-type tram engines.

He wrote to me also, as he had heard that locomotives of this type were used in the brewery of A. Guinness & Son, in Dublin.

This is so, and through the courtesy of the chief engineer to the brewery, I have been able to obtain a set of general arrangement and detail drawings of these unusual vehicles, which I am sending to Mr. Hallum. The locomotives, which are still in use, designed by Mr. Samuel Geoghegar chief engineer to the brewery, were, I believe, built by a Dublin firm and are described in the Proceedings of the Institution of Mechanical Engineers, dated July, 1888. Regarding the gearing to the driving wheels: this is accomplished by coupling-rods operating in the vertical plane from the crankshaft to the main driving axle.

As the locomotives are sprung, the upper and lower axleboxes are connected together by links in order to keep the centres at fixed distance.

The gauge of the locomotives is 22 in., but as sidings of the normal Irish rail gauge of 5 ft. 3 in. extend into the brewery, and it was not considered desirable or expedient to have locomotives of two separate gauges, geared haulage trucks of 5 ft. 3 in. gauge are used.



The 22 in. gauge locomotive is lifted by hydraulic power, and set on a haulage truck, the four locomotive wheels engaging with grooved wheels on the haulage truck, which they drive by friction. The grooved wheels are suitably geared to the axles of the rail wheels.

Yours faithfully,

Dublin. J. A. S. MORAN.
President, D.S.M.E.E

International Racing

DEAR SIR,—I have read with interest the correspondence and Mr. Westbury's article on the above and feel that now is the time for all interested in the sport to express their views.

There can be no doubt that all interests should be served and, equally a distinction must be made between *trade* and *private construction*.

The way to encourage competitive sport is by having rules which give equal opportunity to all, and I think the M.P.B.A. rules come very near this ideal.

The question of using Victoria Park lake for International events seems to me to need some discussion.

Ideally, I think each club affiliated to the M.P.B.A. should, in annual rotation designate their Annual Regatta as "The International Race" for classes A, B, C, and CR. and so bring into use as many different conditions as possible to the advantage of some perhaps and disadvantage to others.

Boats are built all over the country and are

run on whatever water is available, and surely this is what a competition boat should do. If the principle of providing the smoothest possible water to favour the highest possible speed is accepted, then it is a very short step indeed to the provision of "wind-breaks" and "wave motion dampers," and any other artificial aid.

I have somewhere seen a picture of an American competitor in a model car race pushing off his car with a pole 15-20 ft. long. This illustrated clearly I though, the lengths to which artificial aids can be taken on the speed at any price basis.

I am in agreement with Mr. Buck's views and consider he deserves the backing of other car builders.

M. Suzor's letter was interesting, but I do not consider that an entry of twelve boats in three classes constitutes an argument in favour of our present racing rules being altered in any way. Nor can I agree that spectator value should be of primary importance to our sport, but only the needs of the sport itself.

Regarding *Lady Babs*, I cannot see any reason for the heartburnings occasioned by her speed. She is certainly an excellent performer, but we have had an odd reference or two in THE MODEL ENGINEER since the war to speeds of over 70 m.p.h. in America with presumably Hornet, McCoy or Dooling engines. It seems to me not so much a case of "what they've got?" as, "They've got it here."

Since the first part of this letter was written, I learn that a method of "wave damping" is to be tried. At the same time Mr. Mitchell tells us that model car racing in America is dead. Killed no doubt, by the practice of sacrificing every other quality to speed.

I was very pleased to see Mr. Mitchell's letter. It seems we share a feeling of regret at the passing of model hydroplanes designed to combine a measure of seaworthiness with speed. It is therefore a great pleasure to congratulate Mr. Williams on the performance of *Faro*, which may be the last of the boats designed to the above requirements.

Using *Faro* as a standard, it would seem that surface propellers and two-point tethering have added nothing to the speed of model speed boats yet, but perhaps they will come into their own when all the ponds have an overhead spraying system which can be turned on after every run to dampen out the "wave motion."

Yours faithfully,

Norfolk. J. S. DUFFIELD.

Automatic Traversing Gear

DEAR SIR,—As I live only some three miles from Mr. Arthur G. Hann of Penzance (though I don't know our friend) whose letter in a recent issue of THE MODEL ENGINEER, *re*: against hand-rack turning, interested me quite a bit. I wonder if he'll be equally interested to know that I rarely use either top-slides or self-acts on either of my lathes, one, a 4-in. "ETA" (25 years' old), the other a 5-in. Milnes, over 20 years' old. Almost all my short chuck work, up to some 2 in. long, is done by hand-racking the saddle. Why? Mainly, I'd say, just habit learnt some 40 years back. It is also quicker on short pieces, and I find it gives me a better finish, whilst I certainly use it for "ending," chamfering or working up to a shoulder. Digs in? Don't recall any, though I've had them when using self-act if I've let my mind wander, or the throw-out didn't come unstuck fast enough.

If I want to rough down a piece of inch, say, I just feed in $\frac{1}{8}$ in. or $\frac{3}{16}$ in., stopping a 1/32 in. or so short of such shoulder that I'm going to make. I can "feel" the tool cutting, and can vary the traverse rate to suit the steel or whatever I'm on, and also to suit whatever tool I'm using by the sound and look of the swarf curling off. As an instance, I can reduce $\frac{3}{4}$ in. mild-steel to nothing in one cut on my 4-in. ETA, open belt, revs about 750, plenty of cutting oil and either a knife or side tool, and no digs in, using hand-rack feed. Now, I don't go anything on this sort of stunt. Lots of people have the idea it is "professional" to take whacking great cuts. Maybe it is, but I've also seen "pros" who have to cut back on their speeds and feeds, due to distortion, wrung-off centre ends and poor finish, just because they were too "hungry."

I find it is quicker and better to take two or three moderate cuts at fairly fast traverse than to plough along at maximum depth using slow traverse with the machine grunting and groaning, and the dickens of a strain on the feedscrew and nuts.

Just a night or so back I made up a batch of 10-B.A. brass csk. screws with rack traverse (hand), and last week did a "special" to show a friend; $\frac{7}{8}$ in. long × 10 B.A. with $\frac{1}{2}$ in. under head left plain. When miked it was O.K. within 0.0005 in.; and I had used no centre either, whilst finish was O.K. too. To complete the shoulder, I use a similar tool rounded to suit radius desired, if any, and just traverse along to the desired shoulder location on workpiece, using inwards feed increments of $\frac{1}{16}$ in. or so—just a second or so's work—till I get an equal-sided "step" in the corner. Just come back right again to clear and inwards till the tool now shows faint contact with rotating finished portion, traverse left again for final, and when tool reaches shoulder, just a *wee bit* pressure left till we halve the scribed line or pop-mark and the job's done—nice shearing back-cut with cross-slide—no digs-in . . . and what's easier than that? Yes, sir, "rack" all the time.

Making ball handles, lever handles or cock-bodies, I invariably use hand-rack and simultaneous cross-slide wangling (or would it sound better if I said "manipulation"?)

We all know the old saying about one man's meat being another's poison, and I reckon turning comes pretty much under the same heading. Anyhow, I hope friend Hann will find the foregoing of interest, and that possibly some others of our fraternity may have found the joys of hand-racking, and will give their views.

Meantime, if Mr. Hann ever should favour me with a visit, I would be honoured to show him around the works—14 ft. × 10 ft.

Maybe he visits Mousehole as rarely as I adventure into the ancient borough of Penzance.

Yours faithfully,

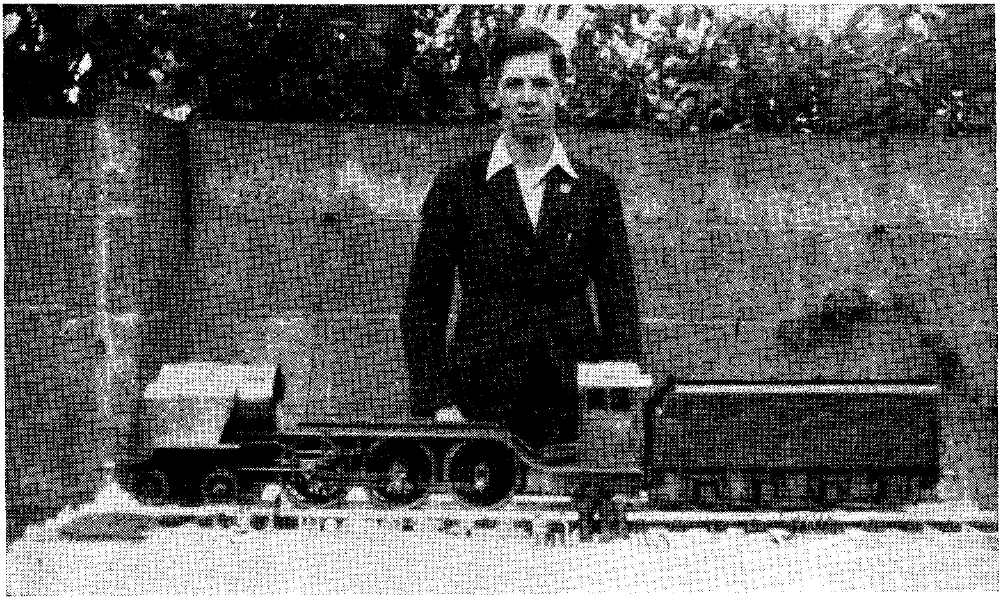
Mousehole. HERBERT J. DYER.

A Coming Engineer

DEAR SIR,—The reproduced photograph is of my son, John, and his partly finished "Hielan' Lassie." His age is 14 years and 10 months, and he commenced to build this loco on May 1st, 1948. He has a Nuttall's hand bench shaper and a Myford M-type treadle lathe. He has made a full-size drawing of the loco, complete with all boiler details, etc. It will be named "Great Northern" and numbered 60113. He has been to Grantham and Doncaster looking for detail.

Yours faithfully,

Greenhithe, Kent. S. G. THOROLD.



Grinding Small Drills

DEAR SIR,—In the January 26th issue there was "A Suggestion from U.S.A." in "Smoke Rings," requesting that an article might be prepared on the subject of constructing a sharpener for small twist drills.

Your correspondent added that "Duplex" only showed a Potts sharpener in two illustrations, but gave no description.

As a very satisfied user of the Potts grinding jig, may I be permitted to recount my own experience of grinding drills down to No. 60 on this excellent tool?

When one approaches the smaller sizes of drills, the tailstock of the Potts jig is very close to the headstock, if I may use such terms to describe these items.

The fingers cannot grip the drill shank when the gap gets too small, and I obviated this by holding the drill in a pin-drill holder, permitting the drill to emerge from the chuck slightly farther than the length of the "headstock" Vee-groove.

The tail-end of the pin-vice rested on the Vee of the "tailstock" and the drills were ground in the usual manner.

"Mr. Meticulous" might object on the grounds that the diameter of the pin-vice, being greater than that of the drill, would make the lip angle of the drill too great, but I find that pressure of the fingers on the drill in the headstock Vee-groove flexes the drill so that it lies flat along the bottom of the groove. A plug turned to fit the tail-end of the pin-vice with a projecting shank of $\frac{1}{16}$ in. diameter to lie in the tailstock Vee would minimise the flexing required to align the drill correctly, but I have not found this necessary.

As a regular reader of THE MODEL ENGINEER since 1932, I can assure that Thursday morning is eagerly awaited for the delivery of my favourite. As a lathe enthusiast I naturally long for articles on my pet theme, but you cannot do other than maintain a fair balance or there would soon be an outcry from those who felt that their pet department was being neglected.

My own lathe is an M.L.7, a very nice job; even so, I still wonder why manufacturers do not fit heavier mandrels on small lathes, I would like a $3\frac{1}{2}$-in. lathe to have a mandrel at least $1\frac{1}{2}$ in. diameter in the bearings and a $\frac{3}{4}$-in. hole through it.

The argument that a lathe design must be balanced and that the slides would give trouble if not stiffened up in proportion to the heavier mandrel, sounds good, at first, but we must remember that this heavier mandrel would be such a boon when that job crops up on which the overhang is unusually large, the tool is still cutting in a fairly normal manner and without excessive overhang from the saddle or cross-slide.

Yours faithfully,

Eston. NOEL OSBORNE.